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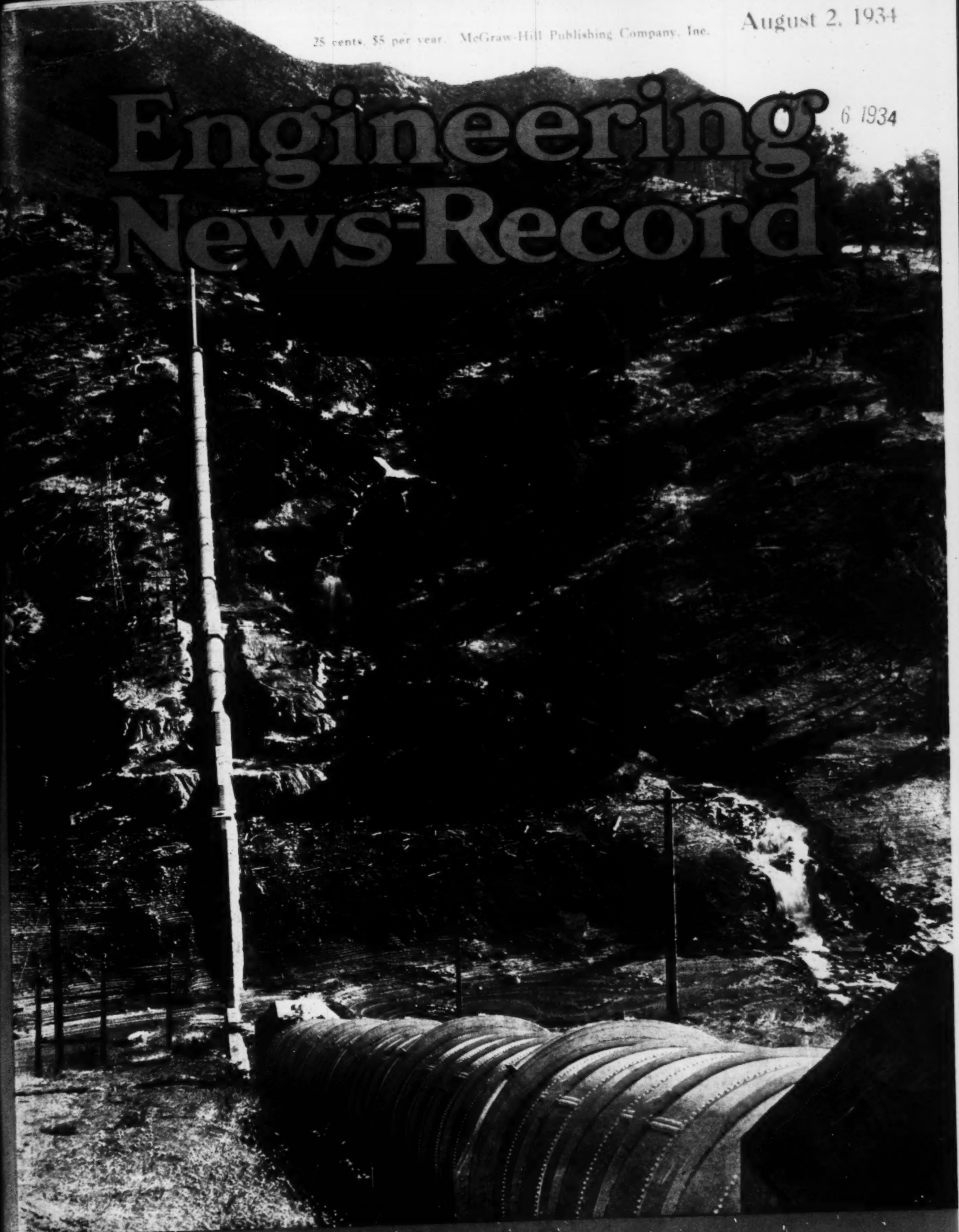
August 2, 1934

6 1934

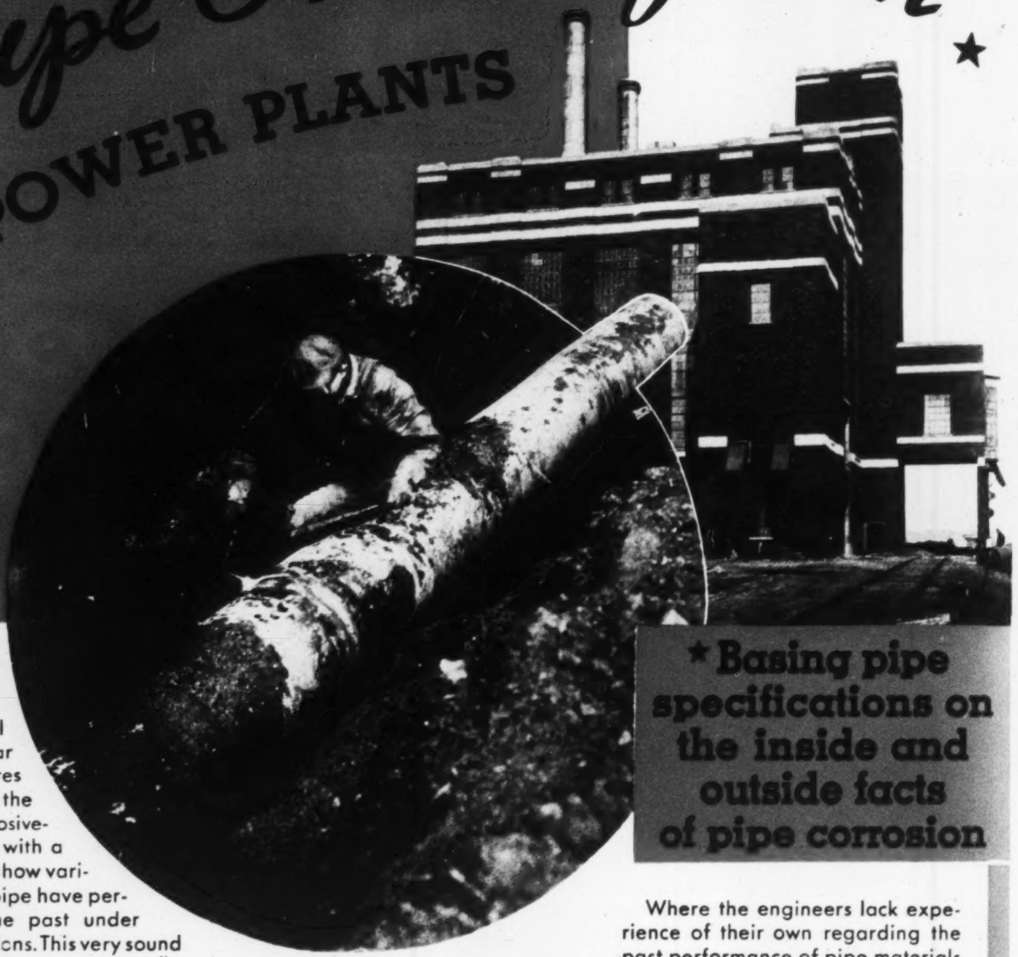
Engineering News-Record



Red Mountain Bar Siphon on Hetch Hetchy Aqueduct

HETCH HETCHY WATER SUPPLY COMPLETED

Four articles commemorating the end of 20 years of construction on San Francisco's mountain water supply system



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..for POWER PLANTS

★ Basing pipe specifications on the inside and outside facts of pipe corrosion

TO select the proper piping material for a particular service requires an analysis of the expected corrosiveness coupled with a knowledge of how various kinds of pipe have performed in the past under similar conditions. This very sound engineering practice we call "Pipe Prescription."

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Here is an example of "Pipe Prescription" as applied to the use of wrought iron in a recently constructed power plant at Wyandotte, Michigan. The consultants were the Froehlich and Emery Engineering Company of Toledo, Ohio. The contractors were Shaw-Kendall Company.

Wrought iron was specified for condensate lines, circulating water lines 8" to 20", city and jet water lines over 1", traps and trap lines, high and low pressure open drain lines and low pressure valve drains.

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A MOMENT WITH THE PUBLISHERS

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NO THINKING man can leaf through the advertising pages of this journal without observing that progress in the materials and equipment of engineering construction has been well maintained, even during the period of general trial and distress from which we now are emerging.

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Through page after page, the crisp, commercial phrases unfold a story of real and substantial technical progress hammered out by resourceful and resolute producers, as often as not in the face of grave anxiety as to their very survival. With one eye on the deficits that month by month have gnawed away their surpluses, aggressive manufacturers have kept faith with the industry they serve.

In the laboratories they have maintained their research, from their designing departments they have required further improvement of their products, in their shops they have striven for lower costs—all along the line they have labored to produce more serviceable materials or more efficient equipment, to insure more economical and trustworthy operation for the users of their products.

To be sure, most of this progress has not been revolutionary; industrial progress usually is achieved by evolution rather than by revolution. For the most part it involves continual refinement in design and manufacture rather than radical change. But each such refinement, however unimpressive in itself, may require costly research, experiment and trial before it can be put to practical purpose.

It is the integration of innumerable such refinements in many products and services that measures the aggregate progress of an industry.

Yet some have introduced new materials or developed novel applications of the old that may open new frontiers to engineering achievement. Still others have evolved more helpful servicing that will enable users to derive greater values from their products. And a few actually have managed to score revolutionary advances in some department of engineering or construction practice.

But whether any individual contribution be great or small, it is the aggregate of them all that accounts for our net advance in productivity, efficiency and safety.

It is not abnormal, of course, that such progress should be developed in the plants of those who produce the materials and equipment of engineering. That is their business, we are likely to say, and let it go at that. Yet to many, who regard manufacturing as a mere repetitive process of mechanical production, it may be noteworthy that there is a highly creative element in manufacturing which has not been permitted to languish, even during a period of economic famine.

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Never have the advertising pages of the industrial and technical journal offered to the engineer and constructor greater value than they do today.

Willard Chevalier

ENGINEERING NEWS-RECORD

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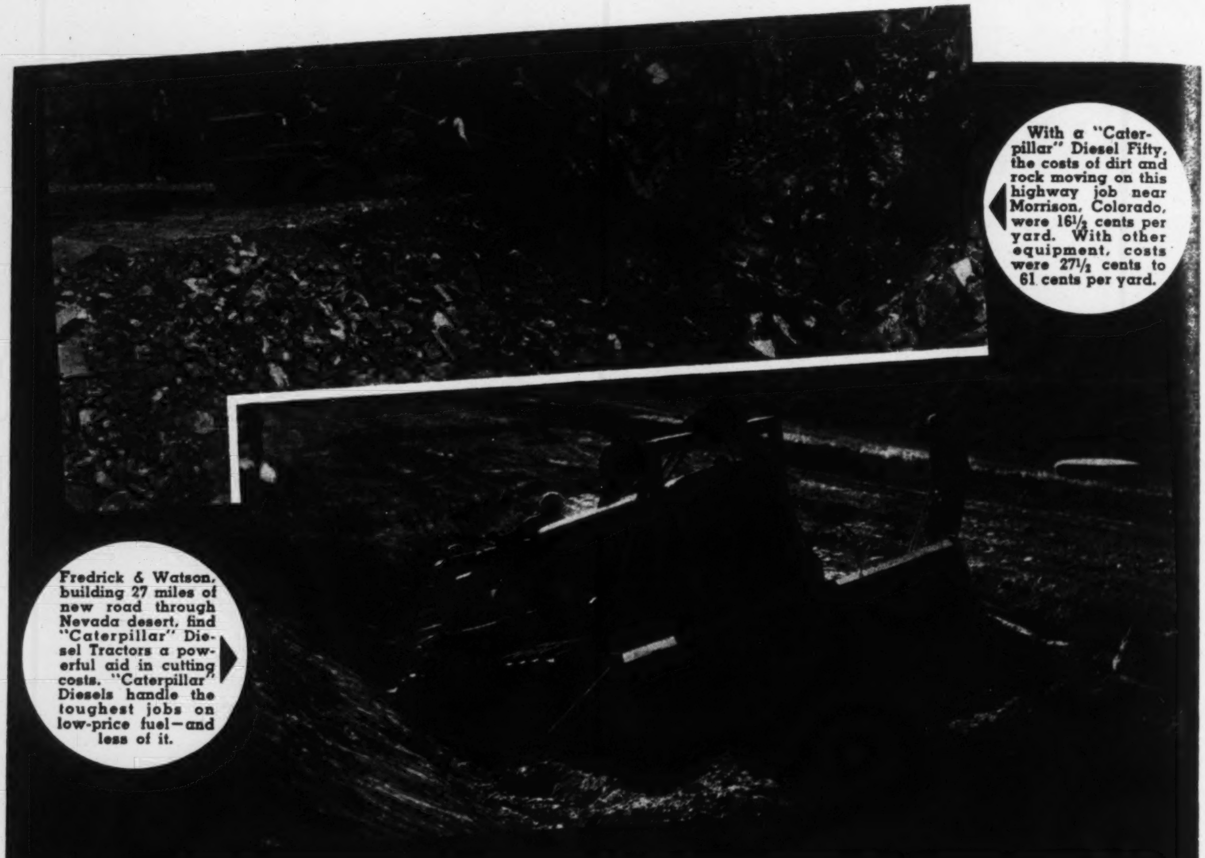

With a "Caterpillar" Diesel Fifty, the costs of dirt and rock moving on this highway job near Morrison, Colorado, were 16½ cents per yard. With other equipment, costs were 27½ cents to 61 cents per yard.

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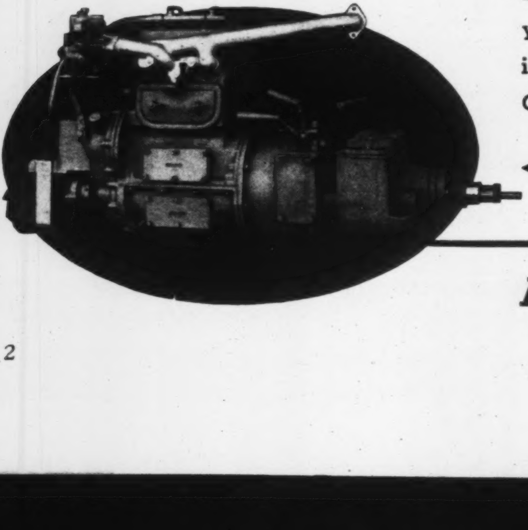

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AMERICA GOES DIESEL

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◆

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In This Issue:

In Devoting the greater part of this issue to San Francisco's Hetch Hetchy water supply, it is hoped that this great project may once again be brought in its entirety to the attention of the reader. Throughout its twenty-year construction period, the various accomplishments have been separately described. But each milestone reached, being notable in itself, tended to obscure the ultimate objective. That objective, adequate amounts of mountain water delivered in San Francisco, is now attained and will be celebrated early in September. It is timely that the information for a proper perspective be presented.

In Addition to a foreword by M. M. O'Shaughnessy, who has guided Hetch Hetchy from beginning to completion, there are four articles:

1. San Francisco's long struggle for municipal ownership of a private water company's properties, its battle to get federal water rights, the decision to develop hydro-electric power and the highlights of Hetch Hetchy planning and accomplishment are outlined in an historical review.

2. How the Hetch Hetchy Aqueduct was planned and built is told by L. T. McAfee, the present chief engineer and general manager of the work. The salient features are described, and cost data and rates of progress are presented.

3. The Third Article takes up the operating problems, which soon will be paramount. And it discusses the need for and the essentials of far-sighted planning for future development and improvement.

4. Finally, the always-important problem of water rights is discussed, which, in the case of Hetch Hetchy, tended sometimes to overshadow the engineering and economic difficulties.

In the News:

The Refusal of the structural steel fabricators to accept the code approved by NRA ended in NRA granting a fifteen-day stay for negotiations. The biggest point at issue is the placing of the steel erection work under the construction code, where the open-shop steel fabricators fear union domination.

Talks of a "heavy construction" general strike in the New York metropolitan area have emanated from leaders of striking union workmen on the Mid-Hudson vehicular tunnel. The issue is the closed union shop.

According to A.F. of L. reports, private industrial unemployment declined in June and continued downward in the early part of July. But, adding 100,000 to public-works rolls during June and putting 125,000 to work on relief, a small net gain was registered.

By Legalizing Betting on horse racing, New England states are creating something of a new industry and stimulating construction. At Narragansett Park, Pawtucket, R. I., a million-dollar plant, including a 14,000-seat grandstand and a clubhouse whose porch and lawn will accommodate 8,000 persons have just been completed in record time.

Last Week the pioneer tunnel on Yerba Buena Island, a part of the San Francisco-Oakland Bridge project, was holed through. About 20 ft. high, it is wide enough for single-track industrial railway operation. The completed tunnel will be 78 ft. wide and 58 ft. high.

Add Momentous Decisions: NRA has ruled that a contractor moving a building "by vehicles upon used highways" is subject to the trucking code, but if the moving is from one lot to an adjacent site or by "rollers, jacks, etc.," the construction code applies.

Cleveland has received authorization to begin spending its $9,000,000 of sewerage-system money supplied by the PWA. First work will cover a $1,000,000 contract for digestion tanks at the Southerly Plant.

Usually at flood stage during the summer months, the Colorado River flowed only 340 sec.-ft. below Yuma on July 24, which is the lowest summer flow on record. An Imperial Valley water shortage is the result.

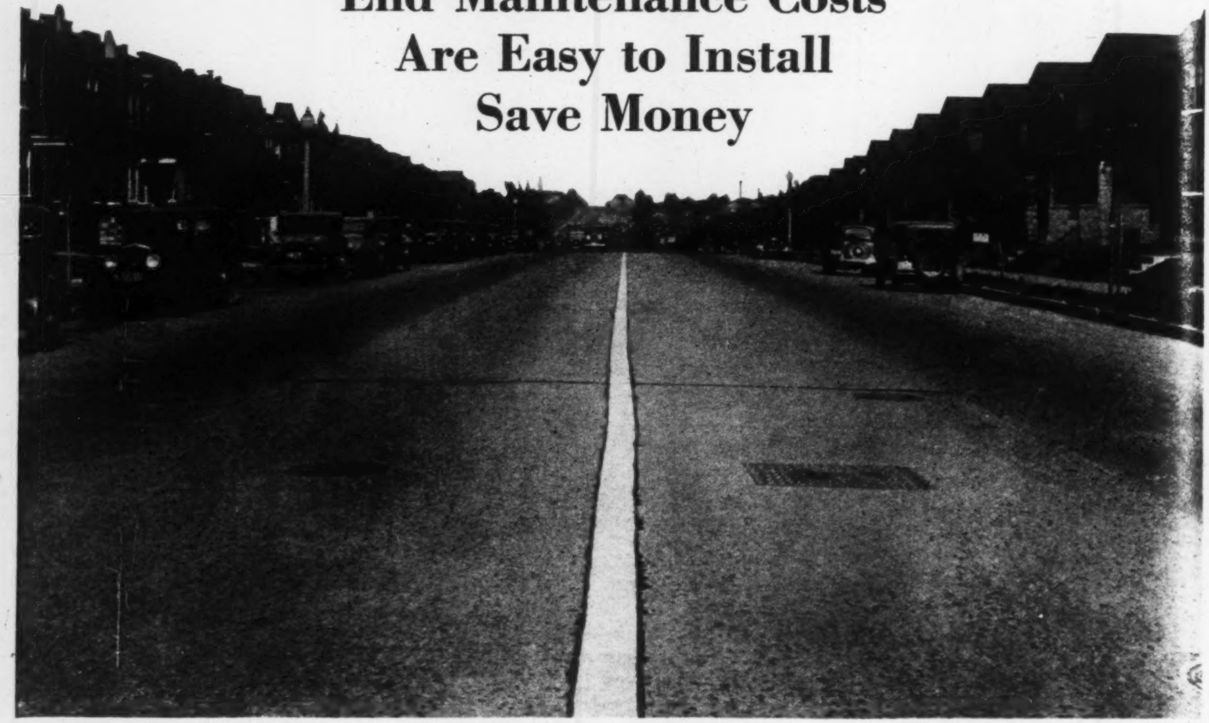
Not in 75 Years have so many rivers sunk to such abnormally low levels during July, according to the Weather Bureau. A news report says that the Rio Grande is completely dry in central and northern New Mexico.

Of the Fourteen states that have passed state recovery acts, New Jersey has probably gone farther than most in setting up a state NRA and in raising questions of federal and state authority. Result: General Johnson wrote Governor Moore that "State codes should be identical in their provisions with federal codes" and "State code authorities should be integrated with national code authorities," even to budget and assessments.

The Question of construction wages in the South, claimed by some to be too high at 40c. per hour minimum, is now in the hands of the Construction Planning and Adjustment Board of the Construction Code Authority. Sullivan W. Jones, chairman, has left Washington to study the problem at first hand.

WHITE TRAFFIC MARKERS THAT *STAY* WHITE

Never Require Replacement
End Maintenance Costs
Are Easy to Install
Save Money



Atlas White traffic marker installed in Chippewa Street, St. Louis, under direction of L. A. Pettus, Assistant Chief Engineer, Department of Paving and Sewers. Chase Construction Co., St. Louis, contractor. Marker installation made by Jack W. Hussey Construction Co., St. Louis.

WHITE traffic markers that *stay* white are built of solid white concrete, made with white portland cement and white aggregate.

These markers never require replacement because they last as long as the pavement lasts.

They end maintenance costs because, being *built* white, with a smooth, dense, hard white surface, they resist staining, and each rain washes them clean of surface dirt. No maintenance is needed to keep them white—*they are always white.*

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These markers save money because their first cost is their last cost. First cost, of course, is higher than for temporary markers. But once they are in—expense stops. All maintenance costs required for temporary markers are *saved* by these permanent markers. They soon pay for themselves by this saving, and then *continue* to save, each year, the total cost of all maintenance otherwise required.

Complete information, including specifications and installation data, is yours for a post-card. Address it to Universal Atlas Cement Co., *Subsidiary of United States Steel Corporation*, 208 South LaSalle Street, Chicago.

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ENGINEERING NEWS-RECORD

HETCH HETCHY WATER-SUPPLY NUMBER

August 2, 1934

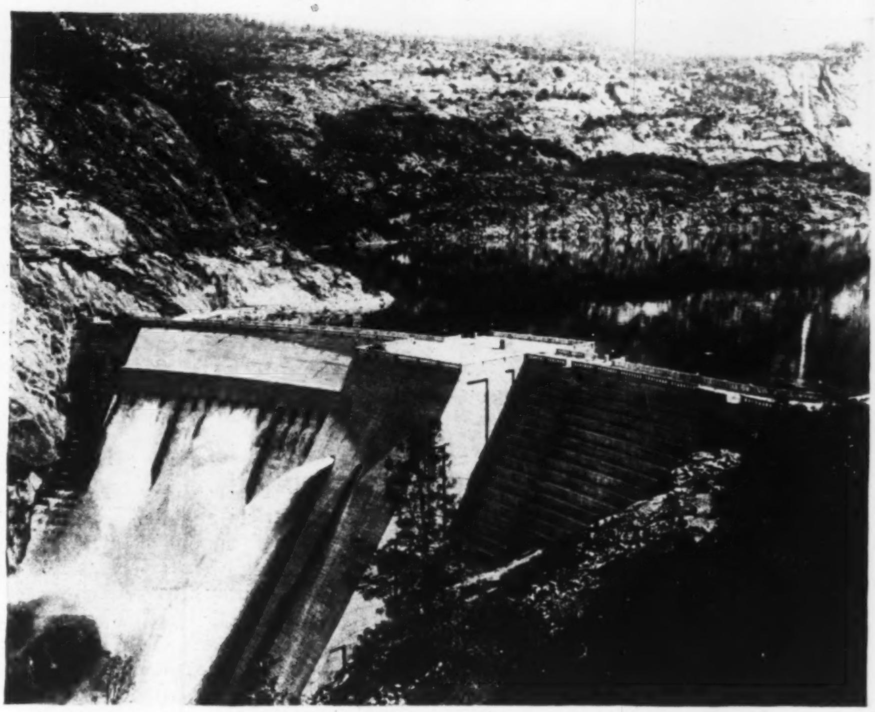


FIG. 1—O'SHAUGHNESSY DAM provides the main storage for San Francisco's Hetch Hetchy water-supply

From the Sierra to San Francisco

NOW THAT the Hetch Hetchy Aqueduct is completed and San Francisco is acquiring an entirely new water supply, the time is opportune to review cause and effect, to take account of what has been done and to appraise problems and conditions that were factors in the achievement. With that objective the following review is presented.

Some thirty years ago, shortly after the break of the century, far-sighted citizens of San Francisco realized that the sources of water supply then in use were of limited capacity and could not be made to produce more than about 50 m.g.d. in the ultimate. Hence, any planning for the city's future 50 or 100 years ahead called for an entirely new and much larger supply. It seemed wise to select and to claim such a source while there was still water available and time to build the necessary works. Fortunately this was done even while the date of exhaustion of the existing supply was many years off. Now the time has come when the old source no longer is adequate, and almost simultaneously with that date the city is celebrating delivery of a pure mountain supply representing a $100,000,000 investment in an aqueduct with 400-m.g.d. capacity.

Within a few weeks water is scheduled to reach the San Francisco peninsula from the distant mountain source tapped by the Hetch Hetchy Aqueduct. This marks the end of a twenty-year construction period, during which the work has come to the attention of engineers far and wide. Carrying on the project has been an almost continuous struggle—a struggle to overcome the opposition of political and other contrary interests, to provide the necessary funds to untangle water-right complications and to suppress I.W.W. agitators and other trouble-makers. Such factors have been paramount to the natural physical problems, which were decidedly unusual in themselves. The main storage dam, when it was built, was rated as one of the major structures of its kind; simultaneously an 18-mile mountain tunnel was driven, and then 30 miles of Coast Range tunnel in which there was a disastrous encounter with gas and swelling ground of a sort that called for concrete lining as much as 3 ft. thick. These are typical of the difficulties confronting the builders.

Through the two decades of construction there has been steadfast adherence to the high principles set up when the work was started by its chief engineer, M. M. O'Shaughnessy. Fortunately he has lived to guide the construction program and to keep it strictly free from taint. Even opponents have made no claim of dishonesty or any misuse of funds—the work has been done effectively and well. O'Shaughnessy Dam, so named in honor of the chief engineer, will remain a monument not only to his engineering ability but also to his perseverance in overcoming difficulties that lay in the path of final completion. It was his wont when the activity was at its height and the problems were coming thick and fast to refer to his work as "doing battle for Hetch Hetchy."

The foreword by Mr. O'Shaughnessy on this page constitutes a proper introduction for the résumé of the salient features of the project by its present chief engineer (L. T. McAfee) and for the other reviews that follow.

As a whole this group of articles combines and condenses into one convenient assembly a composite picture of essential elements in one of the outstanding water-supply projects of modern times.

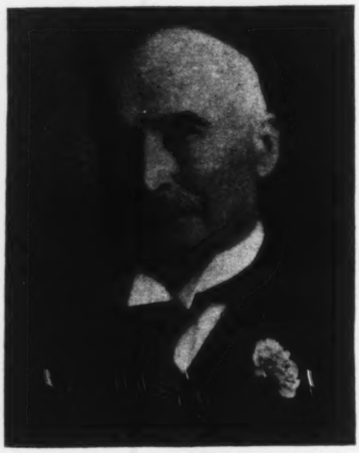
A Foreword by M. M. O'Shaughnessy

For 20 years "The Chief" was city engineer of San Francisco and chief engineer of the Hetch Hetchy project for which he now is consulting engineer

THE LAST 30 miles of tunnel, which constitutes final construction on the Hetch Hetchy Aqueduct, will be completed and ready for service in September with the placing of 5 miles of tunnel lining between Mitchell and Mocho shifts. None will be happier than I to see the water flowing at last.

On Sept. 1, 1912, I was appointed city engineer of San Francisco by James Rolph, Jr., then mayor, who put in my hands complete charge of engineering, including municipal railways, various engineering works under way in the city proper and the Hetch Hetchy project, at that time not yet in the construction stage. I accepted this responsibility with the understanding that all the engineering would be carried out on a business basis and without political interference of any sort, and I desire to record here that there always was strict adherence to this policy during my administration.

When I took office the city was operating under a charter already twenty years old providing for three units of government—eighteen supervisors elected by the public at large, a board of three public-works commissioners selected by the mayor, and the mayor as head of the city government. My previous experience had been with publicly owned utilities, and one of the difficult problems was to bring various factions and departments into agreement, adjust points of controversy and overcome such prejudices as might interfere with a united front on such important matters as the planning and construction of the Hetch Hetchy project.



Before the Hetch Hetchy work could be undertaken, approval from Washington was necessary. Through the broad vision of ex-Mayor James D. Phelan the campaign ultimately succeeded. John R. Freeman, of New York, was retained as chief consulting engineer, and he prepared a voluminous report.

It was necessary to enter Yosemite National Park to provide the required storage, and at first Washington was so confused by the contrary demands of nature lovers, irrigation districts and the private water company that President Taft appointed a board of three United States Army engineers (General Biddle, Colonel Taylor and Colonel Crosby) to review the project. They in turn, employed H. H. Wadsworth, whose conclusive report of Feb. 19, 1913, did much toward enabling the city to obtain the desired grant to develop its water supply in Yosemite National Park.

The history of the project in large measure is a history of battles. Victory in getting federal permission was only the opening gun. There followed battles to establish and hold rights, to cut down unreasonable demands on the city, to maintain construction schedules in war time, and afterward to weed out radical agitators, to keep a municipal construction job on a strictly business basis, and to induce the public to be patient and vote bonds for a water supply in the future. Despite the rough and mountainous region where this supply is developed, on a stream whose large floodflows in some years are nine times the volume of the lean years, it was not the engineering problems, but these others, that really were the main obstacles.

As the great undertaking is brought to completion I want to pay a tribute of acknowledgement to the excellent staff which has supported me throughout the construction period.

——M. M. O'Shaughnessy.

San Francisco's Water Supply

An Historical Review

A long struggle for municipal ownership of a private water company's properties, a battle to get federal water rights and a 20-year construction period all achieve their objectives with completion of the Hetch Hetchy project

FROM 1776, when the Padres established the Mission St. Francis de Assisi alongside a little stream, to the days of the California gold rush, the most primitive means sufficed to bring water to the inhabitants of the little settlement on San Francisco Bay, then known as Yerba Buena. Springs and wells contributed their quota; water was even brought across the bay in barges and peddled from door to door, to bring a price as high as $1 per bucket.

In 1858 a supply was flumed into the city by a private company from Lobos Creek, pumped into two reservoirs, which are still in use, and distributed through a cast-iron pipe system. Shortly afterward the Spring Valley Water Works began development of springs and streams within the city.

After a spirited battle between the companies, in which one even tapped the other's mains, the newer company absorbed the old and acquired a practical monopoly of San Francisco's water supply.

Then began the process of reaching farther and farther for water, a process that has continued ever since. The first venture was into San Mateo County, to the south, by building a redwood flume 32 miles long, to bring in water from Pilarcitos Creek. In 1867 the Spring Valley Water Works was strengthened by the employment of Hermann Schussler as chief engineer. With energy and vision, he was the leading spirit of the organization for more than 40 years. Development of all practicable sources on the San Francisco peninsula was completed in the 80's, and the company then extended its works across the bay into Alameda and Santa Clara Counties, with a final development of 60 to 65 m.g.d. under normal rainfall conditions.

During the whole period of development there was constant friction between the company and the consumer. The company always was slow to increase its supply as the population grew. Gradually sentiment grew for municipal ownership, preferably of a supply with Sierra Nevada sources, which would undoubtedly be more dependable.

Going to the Sierra

J. P. Dart, a civil engineer of Sonora, Tuolumne County, in 1882 suggested the Tuolumne River for the water supply of San Francisco and other cities in California. This stream rises along the crest of the Sierra Nevada in Yosemite National Park, flows west through the mountains and foothills to emerge into the central valley and join the San Joaquin River flowing north, ultimately reaching San Francisco Bay. The U. S. Geological Survey in 1899 published a report which stated that the river could furnish San Francisco with 250 m.g.d.

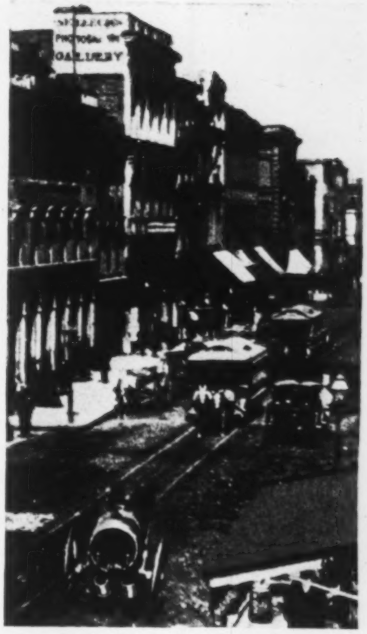


FIG. 3—WATER CARTS comprised the water-distribution system and horse-cars the transportation system in San Francisco during Civil War days. This is an 1865 view at Montgomery and California Sts.

In 1900 the city adopted a new charter containing a declaration for municipal ownership of public utilities, and this spurred on the city authorities to the first steps toward acquisition of a water supply. Studies made of many sources, under the leadership of Mayor Phelan, indicated the superiority of the Tuolumne River, and in 1901 water appropriations were filed on it and its tributaries in accordance with California law.

The chief difficulty lay in the fact that Hetch Hetchy Valley and Lake Eleanor, which would be the principal reservoirs, were both within Yosemite National Park. Applications

---

CHRONOLOGY, HETCH HETCHY PROJECT

Jan. 8, 1900—San Francisco adopts new charter providing for municipally owned water supply.

July 29, 1901—Appropriations made on Hetch Hetchy and Lake Eleanor water sources.

Oct. 16, 1901—Applications filed with U. S. Dept. of Interior for authority to build dams at Hetch Hetchy and Eleanor sites.

May 11, 1908—Original application for construction permits in Yosemite National Park approved by Secretary of Interior Garfield.

Feb. 25, 1910—Secretary of Interior Ballinger issues order to show cause why Hetch Hetchy water source should not be eliminated from permit.

July, 1912—"Freeman Plan" of Hetch Hetchy development published and submitted to U. S. Army Board.

Sept. 1, 1912—M. M. O'Shaughnessy appointed city engineer.

Dec. 19, 1913—Raker Act signed by President Wilson.

July 8, 1914—Bids received for Contract No. 1 (road construction) on Hetch Hetchy project.

May 6, 1918—Construction power house on Cherry River begins operations.

July 7, 1923—Dedication of Hetch Hetchy Dam (now O'Shaughnessy Dam).

Aug. 14, 1925—Delivery of power from Moccasin power plant marks completion of Mountain Division storage and tunnels.

May 21, 1926—Bay Crossing Aqueduct brings water to San Francisco peninsula from Calaveras Reservoir.

Dec. 6, 1928—Completion of tunnel driving in Foothills Division.

March 4, 1931—First tunnel (4.4 miles long) in Coast Range Division holed through.

September, 1932—San Joaquin Valley pipe line completed and water reaches west edge of San Joaquin Valley.

September, 1934—Scheduled arrival of Hetch Hetchy water on San Francisco peninsula.

to build dams and other structures, filed in 1901, were denied by the Secretary of the Interior, who claimed lack of authority to make such a grant.

When the city began its recovery from the great earthquake and fire of 1906, city engineer Marsden Manson prevailed upon Secretary Garfield to reopen hearings, and on May 11, 1908, the Secretary granted certain revocable rights to the city under what is known as the Garfield Permit. One of the principal conditions of the permit was that the city should develop Lake Eleanor to full capacity before attempting any work at Hetch Hetchy.

In November, 1908, the citizens by a vote of 6 to 1 authorized a bond issue of $600,000, to buy necessary lands and water rights. Plans and estimates were then prepared, and on Jan. 14, 1910, a bond issue of $45,000,000 was authorized by a vote of 20 to 1, to construct a complete water system. An alternative proposition, to authorize $23,000,000 for the mountain supply and $35,000,000 to buy the Spring Valley Water Co.'s system, barely failed to carry.

Shortly after this election, Secretary Ballinger cited the city to show cause why the Hetch Hetchy part of the Garfield Permit should not be revoked. This led the city authorities to decide to apply to Congress for a grant of the desired privileges, so that the city's activities and its investment might be protected and given some permanent and irrevocable standing.

John R. Freeman plan

In 1910 the city engaged the services of the late John R. Freeman, to prepare its case for submission to Congress. Under his direction the whole system was re-designed along modern lines into what is known as the Freeman Plan, which with slight modifications has been followed in the construction. This plan, presented in July, 1912, calls for (1) delivery of 400 instead of 60 m.g.d. as did the previous plans; (2) generation of 250,000 hp. of hydro-electric energy; and (3) gravity delivery instead of pumping.

Studies of the Tuolumne River supply and of eighteen other sources were submitted to a board of Army Engineers, consisting of Col. John Biddle, Lt.-Col. Harry Taylor and Maj. Spencer Crosby, selected by President Taft for this purpose. This board in its report of Feb. 19, 1913, upheld San Francisco's selection of the Tuolumne River as the most available, the cheapest and as having the greatest possibilities for hydro-electric development.

This decision was the opening gun for a bitter battle that was waged in Congress during 1913. San Francisco was opposed by nature lovers, water companies, power companies and irrigationists. M. M. O'Shaughnessy, appointed city engineer in September, 1912, bore the brunt of the battle for the city.

HETCH HETCHY ENGINEERING STAFF

***M. M. O'Shaughnessy,**	**Consulting engineer**
L. T. McAfee,	**Chief engr. and mgr.**
***L. W. Stocker,**	**Chief civil engineer**
R. L. Allin,	**Hydraulic engineer**
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L. A. McAtee,	**Constr. engineer**
John H. Ryan,	**Asst. constr. engr.**
A. J. Wehner,	**Safety engineer**
***P. J. Ost,**	**Electrical engr.**
***A. B. Johns,**	**Asst. electr. engr.**
Thornton Easler,	**Asst. electr. engr.**
***J. H. Best,**	**Chief surveyor**

***Connected with the work since construction began.**

Finally the proponents were victorious, and on Dec. 19, 1913, President Wilson signed the Raker Act, which granted to the city the right to build dams, conduits, etc., in the Yosemite National Park and in the public lands. Shortly afterward the city ratified the act and a construction program was outlined.

This schedule contemplated as initial item the construction of O'Shaughnessy Dam at Hetch Hetchy, Moccasin Power House, and the 18 miles of tunnel connecting them, all in accordance with the stipulations of the Act. Thereafter the remainder of the aqueduct was to be constructed on the most economical time schedule, aiming to bring the mountain water supply into San Francisco by the beginning of 1933, the time at which it was estimated that the city would have outgrown the capacity of the Spring Valley system.

This program, thus, was in accordance with the stipulation of the Raker Act that "The said grantee shall not divert beyond the limits of the San Joaquin Valley any more of the waters of the Tuolumne watershed than, together with the waters which it now has or may hereafter acquire, shall be necessary for its beneficial use for domestic and other municipal purposes." This provision prevented the city, had it so desired, from entering into competition with the business of Spring Valley Water Co.

Private system acquired

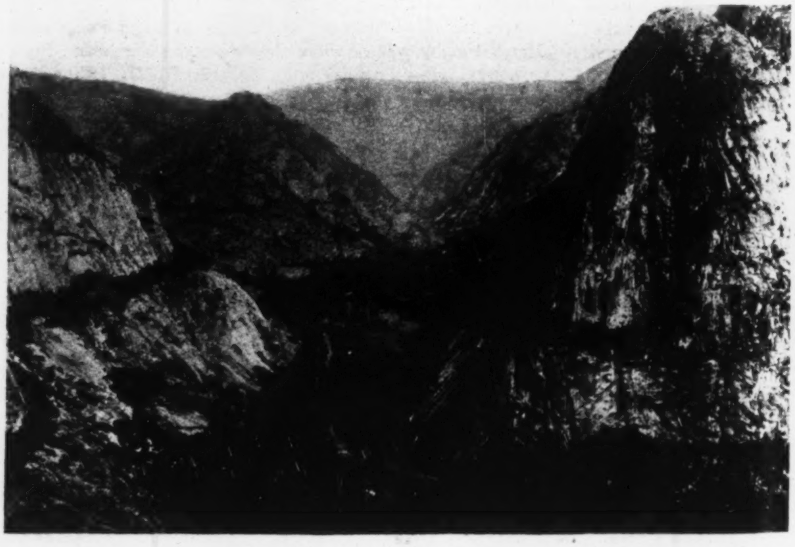
For many years San Francisco was one of the very few large cities of the United States to have its water-supply service in the hands of an independent private company. By the time the Spring Valley properties finally were purchased in March, 1930, San Francisco had become the last large city of this country to take such a step, so that its action made American cities unanimous as to water-system ownership. Why the voters held out so long against city ownership is a debatable point, but there is always difficulty in getting a two-thirds majority for any large bond issue. The story of the campaigns for Spring Valley purchase can be told concisely in a tabulation of results as follows:

Election Date	Am't. to Be Paid	Vote For	Vote Against
Jan., 1910.......	$35,000,000	22,068	11,722
April, 1915.......	35,000,000	39,975	33,518
March, 1921.......	38,000,000	43,073	30,992
June, 1927.......	40,000,000	41,463	28,611
May, 1928.......	41,000,000	82,490	21,175

The combination of the local system with the mountain sources provides San Francisco with an excellent water system, capable of being developed to supply nearly 5,000,000 people.

After a period of surveys and miscellaneous preliminary work, the first contract, "for construction of a road from

FIG. 4—BEFORE the O'Shaughnessy Dam was built across the head of Hetch Hetchy Valley, which is surrounded by glaciated cliffs. Compare with Fig. 5.



Mather to Hetch Hetchy," was let in July, 1914.

First delivery of power

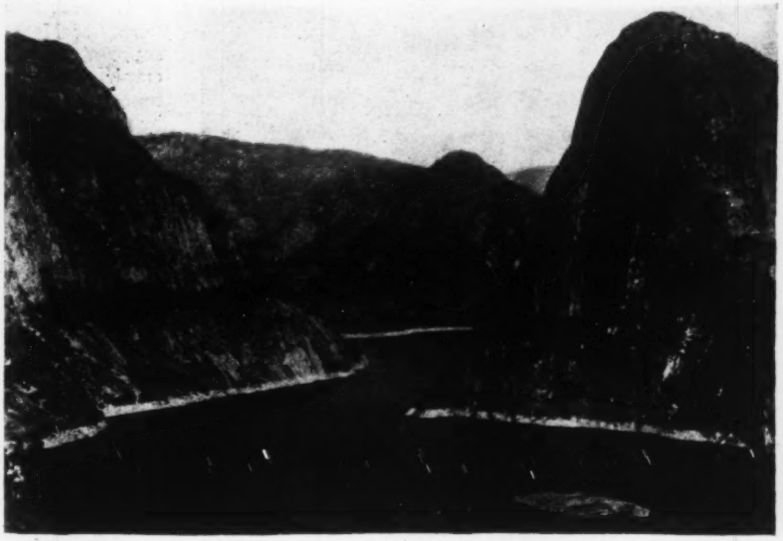
Moccasin Power House was built according to schedule and began production of power on Aug. 14, 1925, delivering it to the shore of San Francisco Bay over the city's own transmission line. From this point it is distributed by the local power company, the city being paid 0.4878c. per kw.-hr. for all power passing into the company's substation. The revenue from power, about $2,000,000 annually, is applied first to operation and maintenance and then to payment of bond interest or bond retirement. Thus power revenues promptly were put to work offsetting interest on that part of the project built long in advance of the delivery of water.

The costs of the various divisions of the system as of June 30, 1933, are as follows:

Hetch Hetchy	$8,162,203
Eleanor	391,747
Mountain	11,522,154
Moccasin (Priest Dam, power tunnel, penstocks, power plant and transmission line)	8,906,026
General utilities applying to above (Cherry power system, sawmill, railroad, boarding house, etc.)	4,000,633
Foothill	8,809,774
San Joaquin	4,526,397
Coast Range (incomplete)	20,413,114
Bay development	5,742,207
General (administration, engineering, legal, lands, water rights, payments to the United States, etc.)	4,559,856
Emergency pipe lines	2,435,753
Total	$79,469,864

Bonds authorized as of June, 1933, total $86,100,000. Of these, $14,600,000 have been redeemed, leaving $70,477,000 outstanding. In 1910 the $45,000,000 bond issue represented a per-capita debt of $109. The outstanding bonds in 1932 represented a per capita debt of $101. The Hetch Hetchy project is now costing the taxpayer annually about 25c. in the tax rate.

FIG. 5—AFTER the O'Shaughnessy Dam had created the 7½-mile-long reservoir in Hetch Hetchy Valley. The water mark indicates a 50-ft. drawdown of the reservoir. Compare with Fig. 4.



STATEMENT OF HETCH HETCHY BOND ISSUES AS OF JUNE 30, 1933

Issue	Vote For	Vote Against	Amount Authorized	Sold	Redeemed	Outstanding
1909 4½%	34,572	5,641	$600,000	$600,000	$600,000	
1910 4½%	32,888	1,609	45,000,000	45,000,000	13,000,000	$32,000,000
1925 5 %	68,549	3,361	10,000,000	10,000,000	1,000,000	9,000,000
1928 4½%	94,859	11,381	24,000,000	24,000,000		24,000,000
1932 5 %	128,691	9,373	1,152,000	1,152,000		1,152,000
.... 5¼%	....	....	4,325,000	4,325,000		4,325,000
....	....	....	1,023,000	....	....	....
Total			$86,100,000	$85,077,000	$14,600,000	$70,477,000

Total payments to contractors (as of June 30, 1933) were $34,646,938, or 43½ per cent of the total construction expenditures (for water and power) of $79,469,864.53.

Day-labor operations

The enviable cost record by day-labor crews in constructing the foothill tunnels led to undertaking the 28.6-mile Coast Range tunnel by the same day-labor methods, and satisfactory progress was made throughout the work. However, a new San Francisco charter that went into effect Jan. 8, 1932, decreed that jobs to cost in excess of $1,000 must be done by contract, and thus it became necessary to call for bids for completion of the last 5 miles of tunnel. Another provision of this charter, however, permits departments to bid for contracts. Bids on the Coast Range tunnels were received by the Public Utilities Commission on June 6, 1932. Besides several bids for portions of the job, there were three bids for the job as a whole.

The Hetch Hetchy Department's bid was $557,670 below the lowest figure offered by a private contractor to complete the 5 miles of tunnel driving and about 16 miles of concrete lining. The figures submitted by the department included a 10 per cent contingency item, but did not include allowance for performance bond. On this last point a controversy arose which held up the final letting of the contract. At that time the work involved a force of about 900 men, and provisions of the pending contract called for completion in February, 1934.

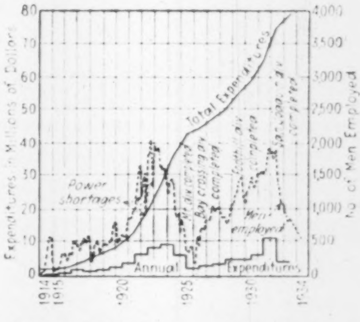


FIG. 6—RECORD of expenditures and the number of men employed during the 1914 to 1934 construction period.

After study and approval of the bid by the controller, and despite vigorous opposition by interested parties, the commission awarded the contract to the Hetch Hetchy Department, and at the present time, with the work rapidly approaching completion, the over-all costs are below the bid price, with every promise of a substantial saving to the taxpayer.

It is expected that the work will be completed in September, ready for transmission of water from the Sierra Nevada to the local reservoirs in San Mateo County. The total cost of construction of the Hetch Hetchy water and power system will then be practically $100,000,000, including about $10,500,000 interest during construction. For this investment, the city will have a system that, with slight further construction, will produce sufficient water for a population of 4,000,000 people and eventually will reduce its water rates from 36c. per 1,000 gal. to about one-half that figure. The design has been along conservative lines and the construction honestly and well done. San Francisco is proud of its achievement.

* * *

Tracing the progress of planning ultimate water supply for San Francisco from the days of horse-drawn water carts to the completion of the $100,000,000 Hetch Hetchy aqueduct system provides the necessary background for a proper appreciation of the construction story. The next article reviews the twenty-year building program and describes the design and construction of the major units.

WHY HAS THE HETCH HETCHY construction period been so long? This is a question over which there have been many arguments. It is typical of public enterprises that the most active and outspoken opponents are the prejudiced and the misinformed. The charge of an "unreasonably" long construction period does not come from those conversant with the terms of the Raker Act, the Congressional grant under which the city has developed the Hetch Hetchy supply.

IN THE EARLY YEARS of construction the city was spurred on by the desire to make good its claim to the water rights and to clinch the grant by evidence of good faith in beginning construction promptly. The Raker Act required that the city, within three years after "the completion of any portion of the work adapted to the generation of electrical energy" begin a power-development program which must be continued for not less than twenty years. This led the city to complete the Mountain Division tunnels and to develop the Moccasin power plant as the first major unit of the undertaking, and hence to make the first fifteen years of the work largely a power project.

THE RAKER ACT also prohibited the city from diverting water outside the limits of the San Joaquin Valley until existing sources of water supply should have been developed to the utmost. In the early twenties it was estimated that, under these limitations, the mountain supply would be needed and could be brought to the city about 1936 or 1937; but to allow a margin of safety, the construction work was programmed so that the aqueduct could be completed in 1932 if emergency should make this necessary.

COMPLETION was delayed two years beyond the program schedule because of delays resulting from two main causes: (1) failure of the city's board of supervisors in 1925 to approve the budget for Coast Range tunnel expenditure, which is said to have delayed completion by some sixteen months; and (2) the tunnel explosion of July, 1930, and the large amount of explosive gas subsequently encountered in the Coast Range tunnels, which necessitated introducing extreme safety measures and caused another year's delay. Explosive gas was the chief physical factor of delay. The other obstacles were of human origin: the limitations and restrictions which hedged about early phases of the work, labor troubles caused by agitators, and the opposition of various groups who for reasons of self-interest sought to prevent the consummation of the project.
—EDITOR.

How the Hetch Hetchy Aqueduct Was Planned and Built

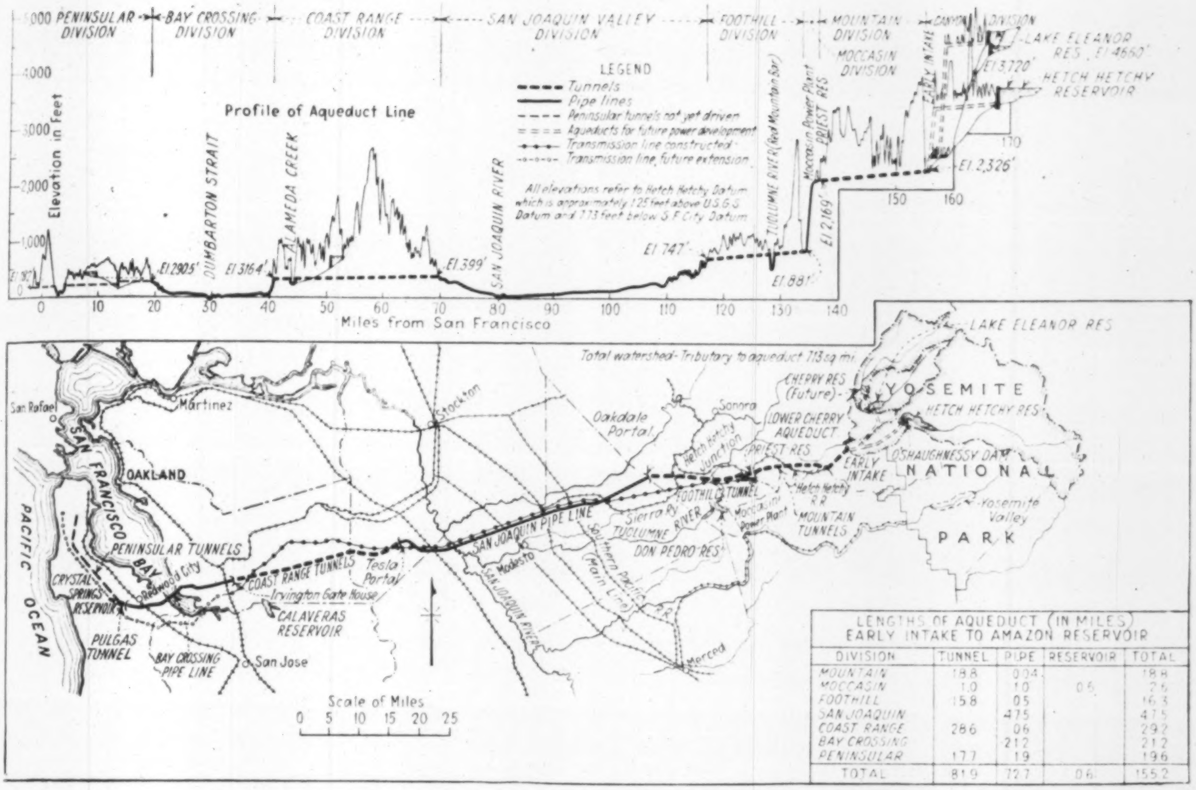
Salient features in planning and constructing the works involved in San Francisco's mountain storage and aqueduct, including cost data and rates of progress

By L. T. McAfee
Chief Engineer and Manager, Hetch Hetchy Construction

AFTER two decades of active work on the Hetch Hetchy Aqueduct, the perspective of time brings out in sharp relief the really essential features of the undertaking. While the current record of progress was being written, small matters sometimes seemed to assume large proportions, or the significance of really important events was not fully grasped. Now that the undertaking has reached its final stage, it is possible to look back at a composite picture and see which factors were vital and what items deserve emphasis. With this in mind and in the endeavor to review the work of building dams, tunnels, power houses and pipe lines from a somewhat interpretative viewpoint the following review of the enterprise was prepared.

The Freeman plan as set up in 1912, whose major features have been followed in the Hetch Hetchy development (Fig. 8), contemplated impounding reservoirs in the high mountain regions supplying an aqueduct leading to the city's distributing reservoirs, and developing hydro-electric power en route. The aqueduct proper begins at Early Intake, 12 miles down the Tuolumne River from the largest of the storage reservoirs. The remaining 138 miles along the aqueduct from this intake to Crystal Springs Reservoir on the San Francisco peninsula consist of seven divisions: (1) the 19-mile Mountain Division tunnel; (2) Moccasin Division, 2.6 miles long, consisting of Priest regulating reservoir, the power tunnel and penstocks to Moccasin power house; (3) the Foothill Division, 16.3 miles long, consisting of Moccasin regulating reservoir and two tunnels separated by the Red Mountain Bar siphon; (4) the San Joaquin Division, with 47.5 miles of aqueduct across the San Joaquin Valley, consisting of steel pipes; (5) the Coast Range Division, consisting of two sections of tunnel, 25.1 and 3.5 miles long, respectively, connected by 3,000 ft. of pipe; (6) the Bay Cross-

FIG. 7—RAILROAD CONSTRUCTION CREW at head of track in 1914 on the 68-mile line replacing mountain roads and trails into Hetch Hetchy Valley.


5000 PENINSULAR DIVISION
BAY CROSSING DIVISION
COAST RANGE DIVISION
SAN JOAQUIN VALLEY DIVISION
FOOTHILL DIVISION
MOUNTAIN DIVISION
MOCCASIN DIVISION
CANYON DIVISION
4000
3000
2000
1,000
0
Elevation in Feet
Profile of Aqueduct Line
LEGEND
Tunnels
Pipe lines
Peninsular tunnels not yet driven
Aqueducts for future power development
Transmission line constructed
Transmission line, future extension
All elevations refer to Hetch Hetchy Datum which is approximately 1.25 feet above U.S.G.S. Datum and 7.13 feet below S.F. City Datum
El. 182'
El. 290.5'
DUMBARTON STRAIT
El. 316.4'
ALAMEDA CREEK
El. 399'
SAN JOAQUIN RIVER
El. 747'
El. 881'
TUOLUMNE RIVER (Red Mountain Bar)
Moccasin Power Plant
PRIEST RES
El. 2,169'
EARLY INTAKE
El. 2,326'
El. 3,720'
LAKE ELEANOR RES., El. 4660'
HETCH HETCHY RESERVOIR
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
Miles from San Francisco
LAKE ELEANOR RES
Total watershed - Tributary to aqueduct 713 sq. mi.
CHERRY RES (Future)
YOSEMITE
HETCH HETCHY RES
LOWER CHERRY AQUEDUCT
PRIEST RES
EARLY INTAKE
O'SHAUGHNESSY DAM
NATIONAL
Hetch Hetchy R.R.
MOUNTAIN TUNNELS
Yosemite Valley
PARK
San Rafael
Martinez
Stockton
Oakdale Portal
Sonora
Hetch Hetchy Junction
FOOTHILL TUNNEL
Moccasin Power Plant
Sierra Ry.
TUOLUMNE RIVER
DON PEDRO RES
SAN JOAQUIN PIPE LINE
Southern Pacific R.R. (Main Line)
Modesto
SAN JOAQUIN RIVER
Merced
SAN FRANCISCO
OAKLAND
SAN FRANCISCO BAY
PACIFIC OCEAN
PENINSULAR TUNNELS
CRYSTAL SPRINGS RESERVOIR
Redwood City
COAST RANGE TUNNELS
Tesla Portal
Irvington Gate House
CALAVERAS RESERVOIR
PULGAS TUNNEL
BAY CROSSING PIPE LINE
San Jose
Scale of Miles
0 5 10 15 20 25

LENGTHS OF AQUEDUCT (IN MILES)
EARLY INTAKE TO AMAZON RESERVOIR

DIVISION	TUNNEL	PIPE	RESERVOIR	TOTAL
MOUNTAIN	18.8	0.04		18.8
MOCCASIN	1.0	1.0	0.6	2.6
FOOTHILL	15.8	0.5		16.3
SAN JOAQUIN		47.5		47.5
COAST RANGE	28.6	0.6		29.2
BAY CROSSING		21.2		21.2
PENINSULAR	17.7	1.9		19.6
TOTAL	81.9	72.7	0.6	155.2

FIG. 8—PLAN AND PROFILE of the Hetch Hetchy Aqueduct system from mountain storage to the terminal reservoirs on the peninsula south of San Francisco.

ing Division, with 21.2 miles of pipe; and finally (7) the Peninsular Division, with 1.9 miles of tunnel and outfall canal into Crystal Springs Reservoir. Eventually the aqueduct will be continued directly to a receiving reservoir in San Francisco, bypassing Crystal Springs.

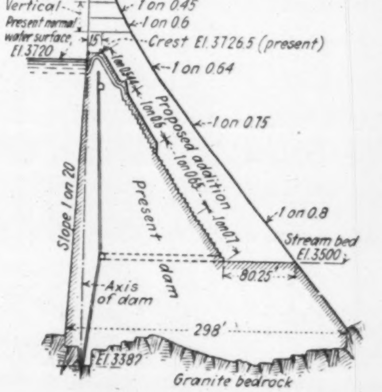
Catchment area

The watershed begins on the divide of the Sierra Nevada, topped by Mount Lyell and Mount Dana, with heights exceeding El. 13,000, and drains west into the Tuolumne River (Fig. 8). Several glaciers contribute a perpetual flow to the river as it runs for more than 50 miles through Yosemite National Park, but the bulk of the flood-season runoff comes from the melting of the immense snow fields during May, June and July. The average annual precipitation is about 40 in. on a total area of 713 square miles, of which 459 square miles are tributary to Hetch Hetchy Reservoir, 193 square miles to Lake Eleanor Reservoir, and 61 square miles to the present diversion dams near Early Intake. The entire watershed is granite and contains not one permanent habitation. Only one main road traverses this area. The mountains north of the river, known as the "wilderness area," are accessible only by rough trails, and the rare visitors to the region are limited to a few horsemen and hardy hikers. Thus the area is ideal as the source of a potable water supply.

Preliminary construction

When ratification of the Raker Act by the city in 1914 cleared the way for actual construction, the first problem to be solved was access to the work. From Mather to Hetch Hetchy Valley there was only a rough trail, 8 miles long, winding over granite cliffs. From Hetch Hetchy to Lake Eleanor the only route was a similar trail that climbed from the floor of the valley to its rim, a rise of almost 2,000 ft. in a distance of little more than a mile. Early Intake, in a canyon 2,000 ft. deep, also was accessible only by trail.

FIG. 9—O'SHAUGHNESSY DAM cross-section, showing present height and the 80-ft. rise to be started at once.


Proposed normal water surface El. 3800
Radius 700'
25'
Roadway El. 3,812 (proposed)
Vertical
1 on 0.45
1 on 0.6
Present normal water surface, El. 3720
15'
Crest El. 3726.5 (present)
1 on 0.64
1 on 0.544
1 on 0.6
1 on 0.65
1 on 0.7
1 on 0.75
Proposed addition
Present dam
1 on 0.8
Slope 1 on 20
Stream bed El. 3500
80.25'
Axis of dam
298'
El. 3387
Granite bedrock

The trail from Mather to Hetch Hetchy was first supplanted by a road 9 miles long and 22 ft. wide, with a maximum grade of 4 per cent and a minimum radius of curvature of 191 ft. This was completed in 1914, under contract No. 1, at a cost of $200,000. For several years it served as roadbed for the city's construction railroad, until at the request of the Department of the Interior the track was removed. In accord with the Raker Act, which requires the city to construct "a wagon road" into Hetch Hetchy Valley, the roadbed was regraded, paved with emulsified asphalt and protected with rubble masonry walls where necessary, at a cost of $140,000. During the season of 1933, more than 17,000 people used this road to visit O'Shaughnessy Dam.

In 1917 the trail beyond Hetch Hetchy to Lake Eleanor was replaced by a one-way road 11 miles long, which served for transportation of construction material to Lake Eleanor Dam. Rising from Hetch Hetchy Valley on a 12 per cent grade for 3 miles, and

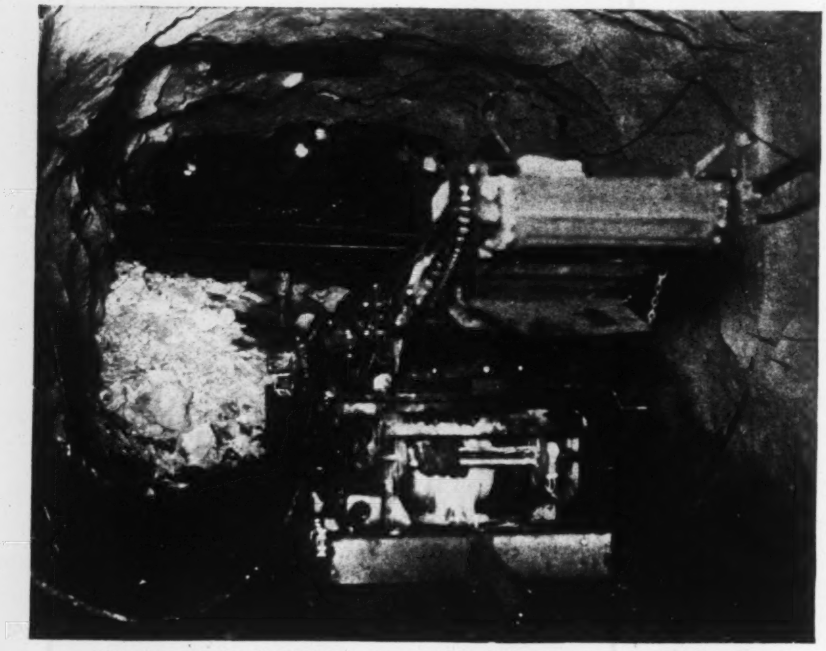


FIG. 10—TUNNEL HEADING in the mountain division in 1921. For 18 miles this granite formation varied only slightly.

with hairpin turns on the brink of the cliffs, this was such a difficult route for hauling that trucks were loaded to only half capacity.

A similar one-way road descends on a 10 per cent grade 3½ miles to Early Intake. Most of the heavy freighting here was done on an incline tramway 0.6 miles in length, which had a maximum slope of 38 deg. The city built numerous other roads, some of them jointly with Tuolumne County, and assisted the state highway commission by donation of crushed rock for highway maintenance and reconstruction.

Railroad, sawmill and power

The principal item of preparatory work was the construction of the Hetch Hetchy Railroad (Fig. 6), a 68-mile standard-gage line that provided rail transportation directly to Hetch Hetchy Dam site from two major railroads. The decision to construct and operate the railroad was made after careful comparison of hauling costs by various methods, taking into account the 233,000 tons of construction materials that had to be delivered. Early contracts for truck hauling in the mountains were based on prices around 45c. per ton-mile. During the peak of construction at O'Shaughnessy Dam, the railroad moved more than 400 tons of cement per day, a feat that would have been difficult for trucks under 1920 conditions. At present, the 59 miles of railroad to Mather is being rehabilitated to serve the enlargement of O'Shaughnessy Dam. The cost of the railroad, inclusive of equipment, was $2,800,000.

As the city owned good standing timber adjacent to the work in the mountains, a sawmill was built early in the construction program. A mill with a capacity of 30,000 ft.b.m. per day was operated for several summers, to produce 21,000,000 ft.b.m. of various timbers and lumber at a cost of about $20 per thousand as compared to $40 when delivered from the nearest commercial mill.

Power for construction purposes in the mountains was furnished by the city's own plant. Although commercial power could have been obtained for practically the same cost, it was considered advisable for the city to build its own plant, to secure greater reliability of service and also to put to beneficial use some of its water rights and thus to perfect its legal claim to them. The construction power system consists of Lake Eleanor Dam, Cherry River Aqueduct, Cherry Power House (capacity 3,000 kva.) and 33 miles of transmission lines. The plant went into service on May 6, 1918, and since then has produced power for the city's construction use valued at $550,000 and has received a cash revenue of $750,000 from the commercial sale of power.

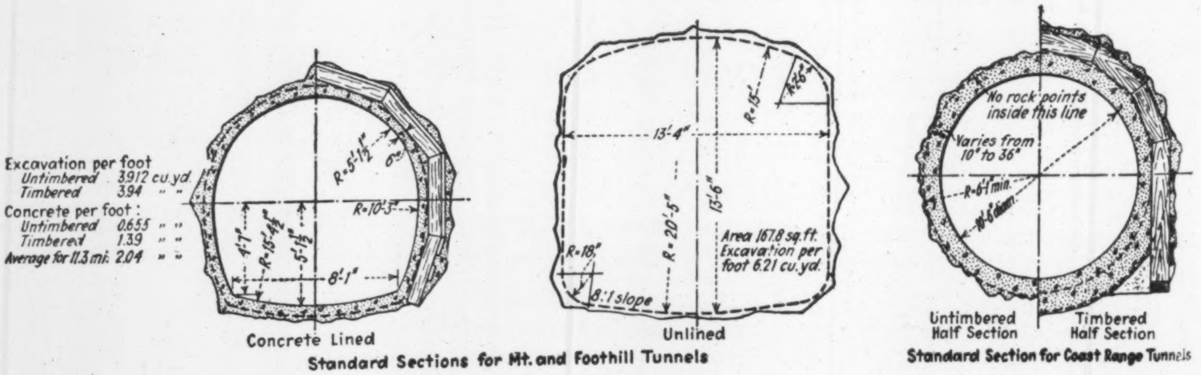
Lake Eleanor Dam

Although the Lake Eleanor Dam site lies 11 miles beyond the terminus of the railroad, its construction began before tracklaying was completed. The dam (Fig. 16) is a multiple-arch structure 1,260 ft. long and 70 ft. high, with crest at El. 4,661. It contains 11,640 cu.yd. of 1:2:4 concrete and 131 tons of steel. The central portion consists of twenty 40-ft.-span arches. At both ends of the dam, gravity sections are used, one end serving as a spillway of 5,000-sec.-ft. capacity. Total cost of the dam, which was built by day labor, was about $270,000. The reservoir has a capacity of 28,000 acre-ft., which is far from adequate to impound the run-off. At a future date a rockfill dam impounding 218,000 acre-ft. or more is to be constructed.

The reservoir area was covered with a heavy growth of red fir and yellow pine, part of which had been logged and sawed for lumber for the dam by a mill with a capacity of 10,000 ft.b.m. per day. Clearing this timber was done during the annual low-water seasons after the dam had been completed.

One man constitutes the entire operating force at Eleanor Dam. During the

FIG. 11—CROSS-SECTION of the tunnels driven in the various divisions of the aqueduct.


Excavation per foot
Untimbered 3.912 cu.yd.
Timbered 3.94 " "
Concrete per foot:
Untimbered 0.655 " "
Timbered 1.39 " "
Average for 11.3 mi. 2.04 " "
R=5'-1½"
6"
R=10'-3"
4'-7"
R=15'-4½"
5'-1½"
8'-1"
Concrete Lined
13'-4"
R=15'
R=26"
R=20'-5"
13'-6"
R=18"
8:1 slope
Area 167.8 sq.ft. Excavation per foot 6.21 cu.yd.
Unlined
Standard Sections for Mt. and Foothill Tunnels
No rock points inside this line
Varies from 10" to 36"
R=6'-1 min.
10'-6" diam.
Untimbered Half Section
Timbered Half Section
Standard Section for Coast Range Tunnels

winter he is isolated, except for telephone communication.

O'Shaughnessy Dam

O'Shaughnessy Dam is the largest single item of the project. It is a concrete dam of arched gravity type, 226.5 ft. high above river level and 118 ft. below to the deepest point of cutoff trench (Fig. 13), 600 ft. long on the crest (El. 3,726.5), and contains 400,000 cu.yd. of concrete. Maximum thickness of foundation is 298 ft. The plans call for increasing its height 80 ft., and with this subsequent raise in view, when the streambed was unwatered, a foundation sufficient for the maximum height was built up to stream level (El. 3,500).

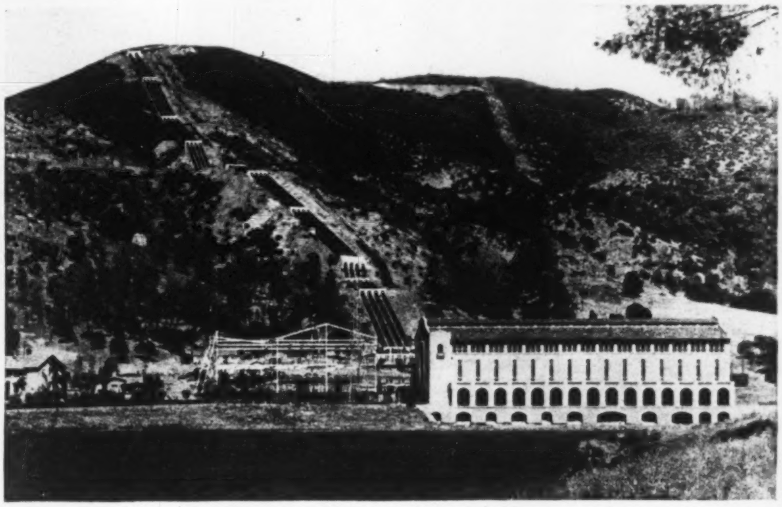


FIG. 12—MOCCASIN PLANT, the largest of four power plants which will ultimately utilize drops on the aqueduct. Present installation of 80,000 kva. will subsequently be increased to 120,000 kva.

The dam (Figs. 1 and 9) was built by Utah Construction Co. (1919 to 1923) at a contract cost of about $6,000,000. Valves and gates bought under separate contracts cost $700,000. The entire investment, including reservoir clearing, roads and camps, totals $8,000,000.

Early estimates of construction presupposed a foundation depth of 25 ft. Diamond-drill borings in 1917 disclosed that the apparently solid foundation consisted of a layer of hardpan and large granite boulders, deposited evidently as a terminal moraine. Water-worn potholes, with their grinding stones, were found at levels far below the present river channel. The foundation was very carefully prepared for concrete, even to roughening the surfaces that had been polished smooth by glaciation.

During construction, the Tuolumne River was diverted through a 23x25-ft. tunnel by means of a rockfilled crib dam 321 ft. long sheathed with two layers of plank with burlap between. Below the cribbing was a row of steel sheet-piling driven down to an impervious stratum of hardpan but not to bedrock. The diversion dam withstood several freshets, one of 8,000 sec.-ft., which brought the water to within 2 ft. of its crest, which was 40 ft. above river level. Fortunately, the engineers had insisted that the contractor raise the crest 5 ft. above the height that he had planned.

In the search for concrete aggregates, an adjacent pit appeared to provide an excellent sand of satisfactory size gradation. However, tests showed this sand produced poor concrete, and chemical analysis revealed the presence of tannic acid, presumably leached out from the live-oak trees. A sand pit that was free from impurities was found 3 miles upstream.

Early Intake

From Hetch Hetchy Dam the water now flows down the natural channel of the Tuolumne River to Early Intake. Ultimately the flow will be through a tunnel and a 60,000-hp. hydro-electric plant. At Early Intake (the beginning of the aqueduct proper) there is a concrete-arch diversion dam 81 ft. high and 262 ft. long, with crest at El. 2,356. On the south bank the arch abuts against the granite canyon wall and at the north end a concrete abutment block containing 3,600 cu.yd. was provided. The spillway, north of the abutment block, consists of five 23-ft. radial gates that operate automatically to maintain the water surface at El. 2,346, or 20 ft. above the tunnel invert at the inlet. Scouring gates in the dam permit blowing out accumulated sand. The dam and headworks were built by day labor in 1923 and 1924 at a cost of $570,000.

The Freeman plan contemplated a half mile of cut-and-cover aqueduct from this dam to the tunnel inlet, but a diversion tunnel was substituted for the exposed work after the unstable formation was indicated by a slide which took out a section of the near-by Cherry Aqueduct during a severe winter. Water discharged from the tailrace of Cherry power house enters the main aqueduct at the original tunnel inlet.

Mountain tunnel

The Mountain Division tunnel, 19 miles long, from Early Intake to Priest Reservoir, consists of 7½ miles of unlined tunnel (13½x13¼ ft.) in granite, and 11½ miles of horseshoe shape, concrete-lined tunnel (10¼x10¼ ft.). The capacity is 400 m.g.d. In driving this tunnel (Fig. 11) 80 per cent powder was used in the cut holes and 60 per cent in the others. Direct costs of driving were $25 per foot for labor and $11 for material. Average monthly progress over long periods ranged from 220 ft. per month in granite to 460 ft. per month in slate, although in one month the tunnel in granite was advanced 451 ft. and the slate tunnel 776 ft. The writer believes that at that time this was a world's record for tunneling in rock of this character.

The bulk of the concrete for lining was batched at two central plants, mixed in the tunnel and placed by pneumatic gun, using steel forms. At several isolated points there was resort to hand placement. Progress in placing concrete sides and arch (1.79 cu.yd. per lin.-ft.) averaged 80 to 115 lin.-ft. per day, including all delays. The invert (0.25 cu.yd. per lin.-ft.) was placed

FIG 13—FOUNDATION excavation for O'Shaughnessy Dam. A flood during the construction period raised the water surface behind the diversion dam 148 ft. above lowest concrete elevation. Upstream diversion dam in background.

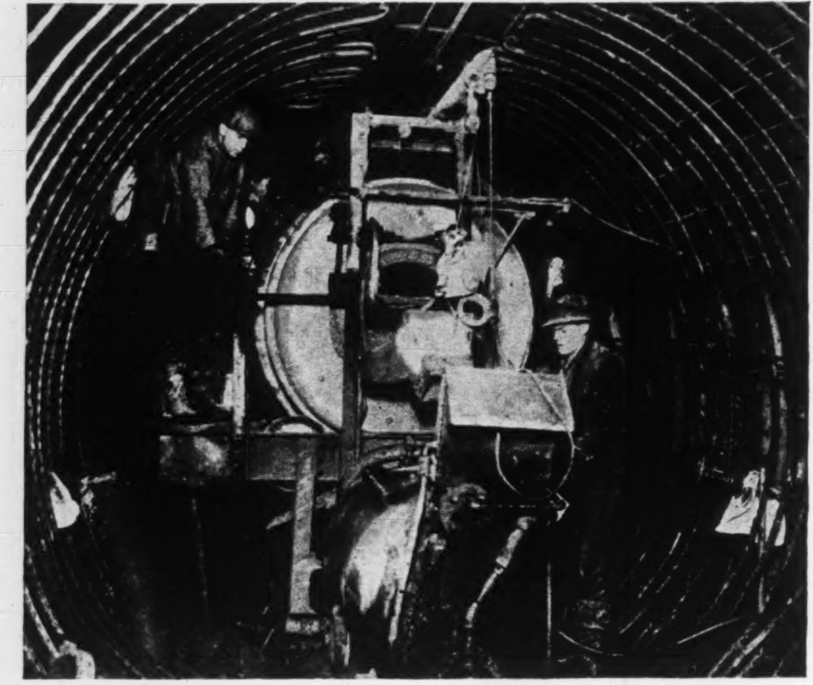


FIG. 14—TUNNEL LINING in the Foothill Division. Near adits and under light cover, heavy reinforcing was used. Mixer and gun were mounted on the same carriage.

last and advanced at a rate of 250 to 350 lin.-ft. per day. The cost of construction of the entire division, including surveys, roads, camps, adits, shafts, etc., was $110 per lin.-ft. (approximately $75 for driving and $35 for lining). The costs per ft. of 2 miles of tunnel in slate from Priest portal were: excavation, $43.32; lining, $24.47; overhead, $2.54; total, $70.33 per lin.-ft., not including cost of equipment.

Five miles from the upper end the aqueduct crosses the South Fork of the Tuolumne River in a riveted steel pipe of 9½-ft. diameter and 225-ft. length, supported on concrete piers as a continuous beam of four unequal spans, the longest being 74 ft. This was a departure from the Freeman plan, which called for a shorter tunnel and a 10-ft. siphon 1,700 ft. long across the South Fork, about a mile west of the location adopted. The change was made to avoid the hazard of a long pipe under high pressure in such an exposed location. The South Fork is in a precipitous canyon, and even the short length of pipe laid is jacketed with 6x6-in. timbers as a protection against falling rocks.

Since the aqueduct went into service in 1925, several inspections of the mountain tunnels have been made. The first inspection disclosed that considerable fine rock and sand had been washed from the unlined parts of the invert and deposited at various places, apparently with some wear of the concrete. Later inspections showed that the wear did not continue. The interior of the steel pipe siphon at the South Fork crossing in nine years of service was worn 0.003 in. at the bottom, as disclosed by micrometer measurement in a hole drilled through the plate.

Moccasin plant

The Moccasin Division includes Priest Reservoir, the power tunnel, penstock pipes and Moccasin power house (Fig. 12) with transmission line. Priest Dam is an earth and rockfill 1,160 ft. long, 147.5 ft. high, with crest at El. 2,245, and contains 717,000 cu.yd. of fill and 17,000 cu.yd. of concrete in a flexible paneled corewall. The upstream portion of the dam is principally hydraulic fill, while the downstream part is loose rock and earth jetted against the corewall. In the twelve years since completion, the downstream fill has settled 9 ft., or 6.2 per cent of the height. Settlement in the upstream section has been 2½ ft., or 1.7 per cent.

At the point of maximum height the corewall has deflected downstream about 2½ ft. Leakage is 0.34 sec.-ft. and has remained constant for ten years, except for slight daily variation, depending upon the fluctuating height of the water in this forebay reservoir. Storage has been continuous, and the reservoir is generally more than half full. The dam was built by day labor in eighteen months (1921-1922) at a cost of $1,000,000.

The power tunnel from this forebay is a 13x13-ft. horseshoe-shaped section 5,370 ft. long, largely through hard amphibolite schist and lined with a minimum of 9 in. of concrete. It connects with a surge chamber 40 ft. in diameter and 160 ft. high, designed to handle surges of 35 to 40 ft. The tunnel inlet structure and shaft cost [illegible] 300,000. Tunnel excavation cost [illegible] per lin.-ft., lining $65.

Moccasin power house and the transmission line to San Francisco Bay have been continuously operated since August, 1925, and up to June, 1934, had brought to the city a revenue of [illegible] 500,000. Plans for the future include a 50 per cent increase in the present 80,000-kva. installation, so that this plant may be able to regulate the output of the other plants in the city's power system, which, on account of limited forebay capacities, will run at fairly constant load.

Leaving the power house, the water enters Moccasin re-regulating reservoir, which serves to equalize flow in the aqueduct below. The dam is 855 ft. long and 50 ft. high, with crest at El. 927. It is largely earthfill, with rockfill toes and contains 143,341 cu.yd. of fill and a concrete corewall. It is planned to build a second dam upstream from the power house to divert the flow of Moccasin Creek through a bypass conduit under the reservoir, as it drains a region of cattle ranges and the water may be contaminated. The present dam and reservoir were completed in 1930 at a cost of $640,000, including appurtenances.

Foothill tunnel

The Foothill Division tunnel starts at Moccasin plant and continues westerly 5.2 miles to a crossing of the canyon of the Tuolumne River at Red Mountain Bar in a steel pipe 9½ ft. in diameter and 2,400 ft. long (Fig. 17). This siphon is of interest in the use of a hinged type of pipe support, resulting in economy in number of piers and size of anchors. This is the second installation of this hinge type in the United States and the first use on a major pipe line.

Since 1925 the water passing through the Moccasin plant has been released at the site of this siphon and allowed to flow back into the river until the start of aqueduct operation through to San Francisco. This location offers an excellent opportunity for a power house, which could be built for $1,000,000 or less and is estimated to produce an initial gross revenue of $500,000 per year by using the power drop in waste water. Increasing diversion to San Francisco would diminish this revenue.

The two units of the Foothill tunnel (Fig. 11) have the same dimensions as the Mountain tunnel, *i.e.*, a 10¼x10¼ ft. horseshoe section where lined (52 per cent of length) and 13¼x13¼ ft. where unlined. These tunnels were constructed during the period 1926 to 1929 at a total cost of $7,700,000 for 15.85 miles, or $92 per ft., including all preliminary work, roads, camps, shafts, power and field overhead.

An interesting comparison of costs by day labor and by contract was brought out in this work. The city forces began the work by building roads, camps, power lines, etc., and excavated about 1,000 ft. of tunnel in each heading so as to give prospective bidders a correct idea of conditions. Upon receipt of bids, it was considered advisable to let about half of the work by contract and to prosecute the remainder by day-labor crews. After completion of the tunnel, an analysis of costs under exactly comparable conditions showed that the day-labor crews excavated tunnel for $35.53 per lin.-ft. as compared to $40.49 by contractors' crews, and had lined the tunnel with concrete for $36.11 per lin.-ft. compared to $47.38 by contractors' crews.

San Joaquin pipe line

The aqueduct crossing of the San Joaquin Valley connecting the west portal of the foothill tunnels and the east portal of the Coast Range tunnels, consists of 47.5 miles of steel pipe ranging in diameter from 56 to 66 in. Its construction, which originally had been scheduled for completion at the same time as the Coast Range tunnel, was advanced as part of an emergency plan to make possible an emergency supply of Hetch Hetchy water to supplement the local supply, which, in 1930, was dangerously low on account of a series of unprecedentedly dry winters. This emergency program included completion of the Red Mountain Bar siphon, San Joaquin Valley pipe line, the short connection at the westerly end of the Coast Range tunnel, and a new pipe line, known as Corral Hollow pipe line, bypassing the uncompleted part of the Coast Range tunnel.

During the fiscal year 1931-32, the city constructed 72 miles of pipe (36 to 104 in.) on the Hetch Hetchy Aqueduct as part of the emergency plan. The program was well toward completion when the winter of 1931-32 increased the local storage in the bay region so that the supplemental supply was not necessary. The Corral Hollow pipe line was completed, but the pumping equipment was not installed. In September, 1932, the water from Hetch Hetchy and Lake Eleanor was brought to Tesla portal, the east end of the Coast Range tunnel.

In designing the present San Joaquin pipe, which was to be nominally 5 ft. in diameter, extended studies were made to keep the shell thickness to ½ in. or less and thus to encourage bidding by makers of various types of pipe. The line as constructed contains about 40,000 tons of steel and was laid at a total contract price of $4,187,919. The connection to the steel manifold at the portal of the Coast Range tunnel is 72 in. in diameter and 595 ft. long.

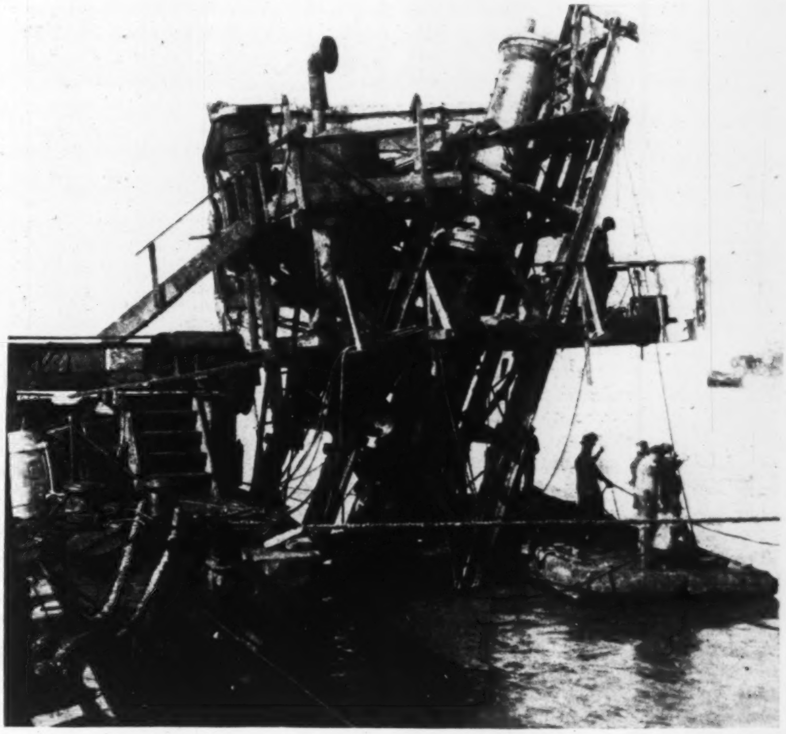


FIG. 15—UNDER THE BAY this 42-in. flexible pipe line delivers water to the San Francisco peninsula at a point 30 miles south of the city. It was put in eight years ago to bring in a local supply pending completion of the Hetch Hetchy system.

A feature of this work was the concrete mortar wrapping of the steel pipe sections (see bibliography) as a protection against corrosive groundwater, made after a careful chemical and electrolytic survey of the area traversed.

Coast Range tunnel

By far the most difficult unit of the entire project has been the 25-mile section of 10½-ft. diameter tunnel through the Coast Range. Plans call for a parallel twin bore at a future date as required. This tunnel penetrates a range of mountains which is geologically young and which has been squeezed and contorted until it is probably 2 miles shorter than in its original state. The fundamental causes of swelling, squeezing and excessive pressure appear to be the material of volcanic origin appearing as grains in the sandstones and also the effects of alteration by steaming waters which at some time permeated these rocks and caused re-crystallization as chlorites and other objectionable minerals. During tunnel driving the swelling has always been stopped by placing a gunite or concrete lining as soon as the ground was opened, and every assurance of permanence is given by observing this lining work after a year or more of service.

In ordinary ground the standard timbering consisted of sets of 8x8-in. posts with segmental arches, set at 5-ft. centers. Heavier ground was held by increasing the size of timbers and by placing intermediate sets; under extreme conditions there might be 16x24-in. timbers at 2½-ft. centers. The slow crushing of timbers by swelling and the consequent retimbering more than once led to the use of annular rings of gunite lining as soon as the ground was opened, holding the top of the tunnel temporarily by crown bars. A subsequent development was the use of quick-setting cement, because the ground developed pressure before ordinary cement could develop sufficient strength.

The most extreme case of swelling was in the last tunnel holed through under the crest of the ridge between the two deepest shafts. Here it became necessary to shoot gunite lining against a form set about a foot inside the excavated ground. This procedure left open space into which the ground could swell while the cement was setting. In this section of the tunnel the gunite was 36 in. thick. The inside diameter of the gunite was always greater than the finished diameter of the tunnel, to allow for the finished concrete lining, or, in some few cases, a troweled cement-mortar finish. The gunite consists of 3 parts sand to 1 part cement, with 3 gal. of water to 100 lb. of cement, and 3 per cent of calcium chloride. This mix gave a strength in excess of 6,000 lb. per sq.in. In the 25-mile unit of Coast

Range tunnel, 46,443 ft., or 35 per cent, has been sublined with gunite.

Quicksand proved very troublesome in a few cases. At one point near Indian Creek shaft the tunnel bottom broke into a deposit, causing a rush of sand accompanied by a water flow of 3,000 g.p.m., which later diminished to 1,000 g.p.m. The sand filled the tunnel completely for 2,500 ft., tapering off to a depth of a few inches at the next shaft. A month later, after the sand had been removed, a second flow occurred. After the water had drained out, and the sand was removed the second time, a small pioneer drift was driven to allow the water to drain. The drift was then widened and the bench removed. There were no surface indications of the existence of this sand deposit, although the tunnel penetrated the formation for more than 900 ft.

COST ITEMS FOR COAST RANGE TUNNEL DRIVING AND LINING

(As of April 30, 1934)

	Nominal Thickness of Concrete L[illegible]		
Average Cost per Lin.-Ft.	18″	21″	[illegible]
Excavation, incl. timbering and maintenance	$59.90	$70.00	$[illegible].00
Invert excavation	2.90	3.70	[illegible].05
Gunite lining	.30	25.40	[illegible].00
Poured concrete lining—invert	5.90	5.50	[illegible].95*
Sides and arch	13.30	9.70	[illegible].50†
Total cost per lin.-ft	$82.30	$114.30	$1[illegible].50
Quantities			
Length excavated, lin.-ft	2,458	3,158	[illegible]113
Gunite lining, lin.-ft	13	1,727	[illegible]314
Gunite lining, cu.yd.	40	4,716	2[illegible]390
Poured concrete lining—			
Invert, cu.yd.	1,446	1,277	[illegible]131*
Sides and arch, cu.yd.	6,072	5,139	[illegible]577†

*Quantity and cost for 7,298 lin.-ft. only. Work still in progress.

†Quantity and cost for 5,405 lin.-ft. only. Work still in progress.

Poured Concrete Lining in Tunnel Excavated Prior to Contract:

Invert, aver. cost per cu.yd	$11.00
Sides and arch, aver. cost per cu.yd.	5.65

Gunite Lining in Tunnel Excavated Prior to Contract:

Average cost per cu.yd.	$16.90

NOTES: The irregularities in unit costs for the individual items of work for the several tunnel sections are due primarily to the length of tunnel in which gunite lining has been placed.

Camps and camp equipment and general construction-plant equipment furnished to contractor without charge. Costs include a nominal charge for certain concreting-plant equipment constructed or purchased by the contractor.

Cost of concrete includes charges for 6 sacks of cement per cubic yard of concrete in place, and costs of gunite include charges for 10 sacks per cu.yd. of gunite. Cost of cement is $1.95 per barrel at the mixer.

Sand and gravel for concrete furnished free to contractor in stockpiles at three locations. Cost of concrete includes charges for handling and hauling sand and gravel for concrete and a small charge for making a small percentage of the aggregates at one plant. Gunite sand was furnished by the contractor.

Gas encountered

Two troublesome gases were encountered, sulphuretted hydrogen and methane. The former caused temporary blindness when absorbed into the blood stream, and, during sinking of Mitchell shaft and in driving from Alameda portal, its presence was very troublesome and resulted in much lost time.

Methane gas in explosive quantities was encountered and, despite the usual safety precautions, an explosion occurred in the tunnel July 17, 1930, which cost twelve lives. Many investigations failed to determine the cause of this explosion. However, more stringent safety regulations were then put into effect, and new equipment of the "permissible" type was installed. This change in driving procedure was made at a substantial cost in time and money.

The observance of safety orders was supervised by a safety engineer employed by the city, by engineers of the state industrial accident commission and by representatives of the U. S. Bureau of Mines. Extensive training in first aid and in mine rescue was carried on in collaboration with the bureau. This training was done on the men's own time, which was willingly given. A great stimulation in the observance of safety rules was the custom that each week each camp which had not had a hospital case from an industrial accident was entitled to a chicken dinner.

The three-compartment shaft has been standard for all tunnel work on the aqueduct, but the dimensions have increased from the original 5 ft. 10 in. x 15 ft. 8 in. outside of timbers, in the Mountain Division, to 6 ft. 10 in. x 18 ft. 2 in. in the Foothill Division and 6 ft. 9 in. x 20 ft. in the Coast Range. Much of the increase resulted from the need for more room in the compartment for pipes and manway. All shafts are concrete-lined. Progress of Coast Range shaft construction (1927 and 1928) was as follows:

Shaft	Depth Ft.	Time Elapsed Days	Average Daily Progress Ft.
Thomas	348	231	1.5
Mitchell	812	396	2.0
Mocho	823	382	2.2
Valle	376	338	1.1
Indian Creek	301	280	1.1

Survey accuracy

The work of the surveyors in projecting the surface surveys down the shafts, through the crosscuts and then into the tunnels, has been very creditable, especially in view of instability of the ground. The following tabulation shows the closures made in tunnel surveys after making correction for earth curvature:

Working Point	Dist. Between Working Points, Miles	Align. Error, Ft.	Grade Error, Ft.	Length Error Ft.
Tesla Portal				
	4.4	1.79	0.015	0.80
Thomas Shaft				
	4.3	1.55	0.273	0.78
Mitchell Shaft				
	5.3	1.70	0.026	2.18
Mocho Shaft				
	2.9	0.69	0.044	1.33
Valle Shaft				
	5.1	0.66	0.038	1.49
Indian Cr. Shaft				
	3.2	0.005	0.046	0.35
Alameda E. Portal				
	(Siphon crossing of Alameda Creek)			
Alameda W. Portal				
	3.4	0.23	0.080	0.85
Irvington Portal				

Concrete lining work

The lining operations, which were carried on from three central batching plants, involved the placement of 180,000, 130,000 and 150,000 cu.yd. of concrete from the respective plants, with a maximum underground haul of about 7 miles. Concrete is mixed underground and placed by pneumatic gun. The work has been carried on without untoward incident.

At the crossing of two dead fault lines some flexibility has been given the lining by introduction of construction joints, although it is extremely improbable that any movement will occur at these points. Nowhere in the tunnel where permanent concrete lining has been placed has there been any crushing of the lining.

To obviate complaints of the drying up of neighboring springs and wells,

PROGRESS OF EXCAVATION ON THE COAST RANGE TUNNEL

Heading	Date Driving Started	Date Holed Through	Distance in Ft.	Elapsed Time Days	Time Corrected for Major Shutdown Days	Aver. Progress, Allowing for Major Delays, Ft. Per Day
Tesla Portal	9/6/28	3/4/31	13,904	910	814	17.0
Thomas Shaft, E.	11/20/28	3/4/31	9,406	835	835	11.2
Thomas Shaft, W	11/20/28	6/7/33	12,801	1662	1425	9.0
Mitchell Shaft, E	2/14/30	6/7/33	9,647	1210	1120	8.6
Mitchell Shaft, W	1/9/30	1/5/34	12,856	1457	1435	9.0
Mocho Shaft, E	10/13/28	1/5/34	15,110	1910	1833	8.2
Mocho Shaft, W	10/20/28	5/12/32	7,926	1299	1130	7.0
Valle Shaft, E	12/23/28	5/12/32	7,377	1236	921	8.0
Valle Shaft, W	12/23/28	1/14/33	11,286	1484	1421	8.0
Indian Cr. Shaft, E	9/26/28	....	15,586	1571	1547	10.1
Indian Cr. Shaft, W	9/26/28	7/29/32	3,951	1402	543	7.3
Alameda East Portal	11/3/28	7/29/32	13,189	1364	1364	9.7
Alameda West Portal	1/29/29	8/11/31	8,806	824	824	10.7
Irvington Portal	12/1/28	8/11/31	9,386	984	924	10.1
Total			151,231			

special care is given to grouting after the concrete has been placed. The first grouting is at low pressure, about 60 lb. per sq.in., which is followed at a later date by 100 lb. per sq.in. or greater. It is considered practically impossible to shut off the ground leakage completely.

Costs of the Coast Range tunnel work prosecuted by the Hetch Hetchy project under the contract beginning August 16, 1932, have been very gratifying. As of April 1, 1934, work valued at the bid prices of $4,724,468.17 had been done for an expenditure of $4,121,877.45. As the most difficult portions of the work have been completed, it seems reasonably sure that the final figures upon completion of the contract will be even more favorable.

Some of the cost figures developed during the contract work are as shown in the table on p. 140.

Submarine Bay crossing

The present submarine pipe line crossing the southern end of San Francisco Bay (Fig. 15) which has been in use since 1926, is to be duplicated as part of a $12,095,000 water-development plan authorized by the voters, November, 1933. This work involves the construction of three submerged pipes 42 in. in diameter and ½ mile long at Dumbarton Strait and of 20.7 miles of 5½-ft.-diam. pipe. The steel bridge across the non-navigable portion of the strait, designed to carry two pipes 6 ft. 4 in. diameter, now has but one 5½-ft. pipe. The hollow pier at the deep-water end of the bridge has connections for three submerged pipes in addition to the one now in service.

Organization

From 1912 to 1932 all activities were in charge of M. M. O'Shaughnessy as chief engineer by virtue of his position as city engineer. After the advent of the new city charter in 1932, which separated the utilities from the other city engineering activities, he became consulting engineer of the Public Utilities Commission. All general engineering work is done in the main San Francisco office. Each major unit of construction is in charge of a construction engineer who is directly responsible to the chief engineer. Bids are invited and contracts let by the Public Utilities Commission. The manager of utilities, appointed by the commission, is executive head of all of the utilities.

[References to articles giving more details about the foregoing work which have been published in *Engineering News-Record* with frequency throughout the construction period are listed in the bibliography on p. 146 in this issue.]

* * *

Completion of the aqueduct system brings to San Francisco the long-sought permanent mountain supply and concurrently introduces new problems of operation and economics. The new system must be harmonized with the existing works, the important power-development possibilities must be programmed, and the future needs of the city must be anticipated. The proposed handling of these problems is outlined in the next article.

Operating the Hetch Hetchy Aqueduct and Planning for the Future

Design and construction blend into problems of efficient operation and economical preparations for future needs—Far-sighted planning required

EVEN a twenty-year construction program cannot entirely finish the work of bringing in from some distant source a water supply that will be adequate for a large city through generations to come. Certain economic considerations in operation and in planning for extensions from time to time are as distinctly engineering as was the original design and construction. Hetch Hetchy perhaps has more than the usual quota of such considerations because of its long construction period, during which new factors have entered and because power development is involved in the project as a whole. In the following are presented some of these aspects that have to do with long-term maintenance of a "going concern."

The plan of the Hetch Hetchy system provides for ultimate delivery of 400 m.g.d., which is sufficient, according to the daily per-capita consumption in San Francisco, for the needs of four to five million people. It is probable that many of these ultimate-capacity consumers will dwell not only in the city, but to the south along the bay in San Mateo and Santa Clara Counties. This peninsula region heretofore has depended largely on underground water supplies, and these have been diminishing rapidly in recent years as a growing population has increased the demands.

The present daily consumption from sources that have been serving San Francisco approximates 50 m.g.d. The several units of the aqueduct have capacities ranging from the ultimate of 400 m.g.d. down to 45 m.g.d. in the pipes where the installment construction plan has been economical. The two mountain storage reservoirs, Hetch Hetchy and Lake Eleanor, now are developed to furnish a safe yield estimated at 200 to 250 m.g.d. When both dams are brought to raised heights, their combined storage of 578,500 acre-ft. is believed sufficient, even through dry-year cycles, to maintain the aqueduct at its 400-m.g.d. capacity.

Original plan modified

The Freeman plan was not intended to be ironclad and inflexible, and as a result of additional data and more complete studies, several modifications of the original plan were made. One of these was the elimination of the proposed storage reservoir at Cherry Valley with the intercepting tunnel across to Hetch Hetchy, and another was the increase in the size of the ultimate Lake Eleanor Dam, made possible by the improvement in design of rock-fill dams.

When the aqueduct project was started it was believed that the system would be more economical and more reliable if storage were provided in two reservoirs. From the standpoint of permanence and maximum safety, the gravity type of dam was selected for Hetch Hetchy (O'Shaughnessy Dam). The present dam is 344½ ft. high, but the foundation up to river level was built for the ultimate height of 430 ft. Under present operating conditions water is drawn from Hetch Hetchy storage to the full capacity of the aqueduct (about 750 sec.-ft.) to develop the maximum amount of power at Moccasin plant and obtain maximum revenue. As a result, no hold-over storage is maintained.

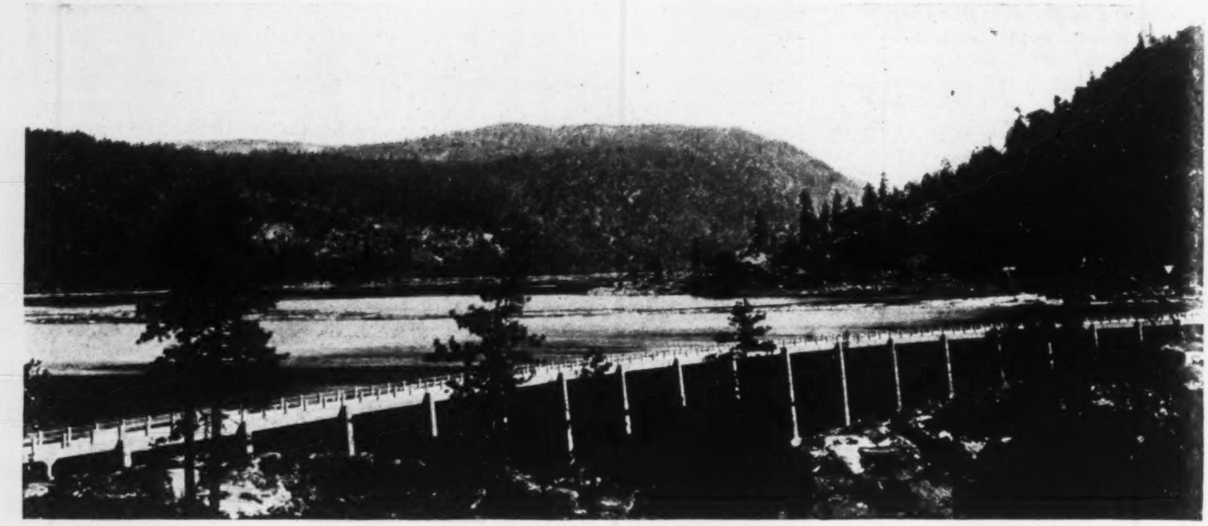


FIG. 16—ELEANOR DAM, a multiple-arch structure which stores water at El. 4661. The present capacity is 28,000 acre-ft., but a future rockfill dam planned for this site will store 218,000 acre-ft.

Unless there is considerable precipitation in the fall of the year, prior to the freeze-up, the heavy draft for power production empties the present reservoir by early winter, and the power output is reduced to that produced by streamflow. The average reduction in possible revenue from this cause approximates $225,000 annually.

Studies indicated that under the prevailing interest charges, the cost of enlarging the dam to its contemplated height would not be justified by the increased power revenue. However, the PWA program has made the work possible by the free grant and the reduced interest rates. The citizens, in November, 1933, authorized the issuance of $3,500,000 in bonds to finance the dam enlargement, and it is expected that the work will be started during the present summer. This work will increase the storage from 206,000 to 360,000 acre-ft. and will provide more water than will be required for domestic use for many years to come.

Capacity to Moccasin plant

The aqueduct from Early Intake is built for a normal operating capacity of 620 sec.-ft. In early Hetch Hetchy history, a report of a consulting board of electrical engineers recommended construction of the tunnel in two installments of one-half this capacity, but, largely to protect water rights, the decision was to build it initially to full capacity. This tunnel has a grade of 1.55 ft. per 1,000. The area of the lined section is 87.94 sq.ft., while the unlined section is either 166.5 or 167.8 sq.ft.

Priest Reservoir, the forebay for Moccasin power plant, has a capacity of 2,350 acre-ft., or about two days' flow of the aqueduct. This makes it possible to unwater the mountain division tunnels for inspection without curtailing power output. The capacity of the power tunnel from the reservoir to the surge shaft is 1,200 sec.-ft., which is considered ample for future requirements when the installed capacity at the power house will have been increased by 50 per cent, to a total of 120,000 kva. This installation increase is planned for the time when the two future power plants at Early Intake will be built. One of these plants, using Lake Eleanor water, will have an installed capacity of 24,000 kva.; the other, using Hetch Hetchy water, will have 42,000 kva. Both will run at practically constant load as their forebay capacities will be very limited and all regulation will be done by the Moccasin plant.

The foothill tunnel below Moccasin plant has the same characteristics as the mountain tunnel. Of its total length of 15.85 miles, 8.2 miles, or 52 per cent, is lined to a $10\frac{1}{4}$-ft.-diameter horseshoe. The grade is also 1.55 ft. per 1,000 and the normal capacity 620 sec.-ft.

The first unit of the San Joaquin Valley pipe line has a nominal capacity of 60 m.g.d., but it is expected that in its early life this capacity will be 70 m.g.d. The Freeman plan calls for an ultimate installation of three $7\frac{1}{2}$-ft. pipes across this valley, but studies indicated the advisability of an initial capacity as noted. The right-of-way across the valley is 110 ft. or more in width, ample to accommodate the three pipe lines and a second power transmission line.

Coast Range economics

The Coast Range tunnel provided an interesting study in economics. As the fall in that division is limited to $2\frac{1}{2}$ feet per mile, a 13-ft. tunnel or two $10\frac{1}{4}$-ft. tunnels would be necessary to equal the capacity in the higher tunnels. The 250-m.g.d. capacity of one $10\frac{1}{4}$-ft. tunnel will apparently be ample for more than 50 years. The cost of this capacity tunnel, constructed as an initial unit, plus the discounted cost of a similar tunnel constructed 50 or more years in the future is less than the cost of the 13-ft. tunnel. It was therefore decided to build these tunnels on the installment plan, the smaller-size tunnel to be paralleled later by a duplicate bore.

To facilitate construction of the future tunnel, the access shafts are permanently lined with concrete. From each shaft, at tunnel level, a crosscut was run north 95 ft. to the center line of the present tunnel and south 80 ft. to the future tunnel line. From the crosscut the future tunnel was opened up for about 50 ft. in each direction and this space used for car storage, recharging of locomotive batteries and other purposes during the present work.

The first tunnel, at present approaching completion, has a finished diameter of $10\frac{1}{4}$ ft. and a grade of 0.5 ft. per 1,000 in the 25-mile section and 0.7 ft. per 1,000 in the 3.4-mile section. The total fall in 29.2 miles, including 0.6 mile of pipe, is 82.6 ft.

Bay crossing

The capacity of the crossing at the southern end of San Francisco Bay is at present limited to one 43-m.g.d. submarine pipe line. However, the concrete caisson which forms the junction structure for submarine pipes and the pipe on the steel bridge has connections for three additional submerged pipes of the same size (42 in.). The development program authorized in the bond election of November, 1933, will increase the capacity of the bay crossing pipes to about 100 m.g.d., sufficient to carry all of the water transmitted through the present San Joaquin pipe line, as well as the yield of Calaveras Reservoir of the San Francisco Water

Department on the east side of the bay. Pulgas tunnel, at the terminus of the aqueduct, has the same capacity as the mountain and foothill tunnels—400 m.g.d.

The delivery of the first Hetch Hetchy water, expected in September of this year, will result in a gradual but steady increase in storage in the peninsula impounding reservoirs of the water department, which during the present summer again give promise of being depleted to a dangerous level. Although their total capacity, including the Calaveras Reservoir on the east side of the bay, is about 60,000 m.g., or more than three years' supply for the city, at the end of the 1933-1934 rainy season, they were storing only 16,000 m.g., or somewhat less than one year's supply.

The route of the Hetch Hetchy Aqueduct crosses but two active earthquake faults between the Sierra Nevada and the peninsular reservoirs. These are the San Leandro fault, upon which there was extensive movement in the earthquake of 1868, and the Calaveras fault. At these points the aqueduct is steel-cylinder, reinforced-concrete pipe which could be expeditiously repaired. As has been noted already, there are some dead faults in the Coast Range, but it is thought most unlikely that they will be subjected to any movement. However, a break there (which could be readily and easily repaired) would not jeopardize the city's supply, as reliance could be placed on the storage of almost two years' supply in the peninsular reservoirs.

There is a probability that the pipe lines from these latter reservoirs to the city might be ruptured during an earthquake, as was the case in 1906. At that time, three days after the disaster, the total water in storage in all of the city distribution reservoirs combined was 16 m.g., equivalent today to eight hours' supply. A campaign to increase the intra-city storage to 1,000 m.g. by construction of three reservoirs has not accomplished very definite results except that during the past winter a large force of men under the auspices of the CWA began construction of the smallest of the three, and it is possible that this work may be completed. However, conditions will be vastly improved by construction of two additional city reservoirs as part of the development program authorized in the bond election of November, 1933, financed by PWA.

Watershed conditions on the Hetch Hetchy project result in water of a very high degree of purity. An analysis of water from Hetch Hetchy Reservoir shows 14.8 p.p.m. of total solids and a hardness of 2.58 p.p.m., or a soap consumption of .00086 lb. per gallon. The hardness of the water supplied to San Francisco from other sources averages about 100 p.p.m., so the mixture of waters from mountain and local sources will result in a very soft supply of excellent potable quality. The Raker Act specifically provides sanitary protection of the watershed, should it become necessary. No treatment is planned for the Hetch Hetchy supply, except the usual chlorination after it leaves the local reservoirs en route to the city.

San Francisco expects many benefits from the introduction of Hetch Hetchy water; a probable water-rate reduction and the consequent influence on the establishment of various industries; greater beautification of the city from increased use of water; many advantages that come from the use of a very soft and pure water; and an attraction to new population and business.

* * *

From the initiation of the project, through the long construction period and on into the planning for future operations the legal problems of water rights have paralleled, and in some instances almost overshadowed, those of engineering and economics. The features of this complicated situation and the final opinion that the essential water rights are amply secure are reviewed in the concluding article.

Hetch Hetchy Water Rights Complicated by Unusual Claims

Despite conflicting principles in California water law and with none of the several suits decided by the highest court, the city's rights are considered secure against contrary claims

THE RIVER from which water is diverted into the Hetch Hetchy Aqueduct is used extensively for irrigation and by other water users, so that from the outset there have been complications in the matter of water rights. Running through a part of the state where water is scarce, the quantities involved in the city's proposed ultimate 400-m.g.d. diversion are important enough to make legal settlement of its claims a matter of critical importance. The quantities, as recorded by a 38-year average of streamflow gagings in the Tuolumne River at La Grange, involve an average seasonal runoff above this point of 1,870,000 acre-ft., with a 38-year maximum of 3,530,000 acre-ft. and a minimum of 563,000 acre-ft. The annual runoff from that portion of this basin that drains into the city reservoirs has averaged 1,205,000 acre-ft., according to records of the U. S. Geological Survey, with a maximum of 2,400,000 acre-ft. and a minimum of 410,000 acre-ft.

The legal history of water rights on the Hetch Hetchy project is quite as long as the engineering history and considerably more involved. Although many suits have been filed, few have been brought to hearing and not a single one has been carried through to final decision before the highest state court. Hence, even after the twenty-year construction period, there is no finally settled and clearly established legal status.

Complications come not so much from a multiplicity of claimants to the water as from the fact that California law clearly makes priority of appropriation and beneficial use the essentials of a valid water right at the same time that riparian rights are recognized by the adoption of the "Common Law" of England in the first constitution of the state. With these two contradictory legal theories in the state law there is no simple process by which water rights can be definitely established except by the user-use for the full prescriptive period beyond which legal attack is unlikely to succeed. Paper records are relatively not important unless supported by proof of continuous beneficial utilization for five years. This presents a difficult problem for the city that is endeavoring to protect and provide for its future by the construction of works that may not be fully utilized for 50 or 100 years more.

These facts were well known to San Francisco, and the city had good legal advice in the early stages of the Hetch Hetchy project, which enabled it to lay plans carefully to protect its legal claim to water. In the long construction period, since the time when these rights were initiated by the customary method of making and recording appropriations, these plans have been carefully carried out and, though the water rights are still under attack, there is little apprehension that diversion up to the full needs of the city will be prevented.

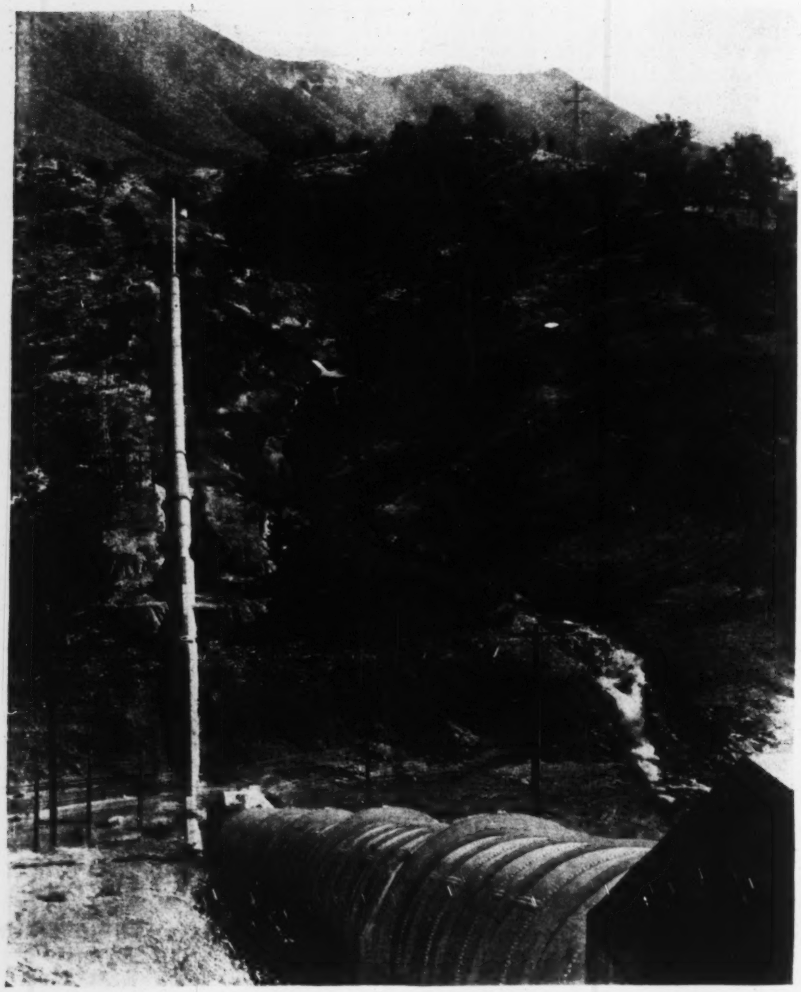
An exhaustive report containing a summary of the water laws under which the Hetch Hetchy rights are held and including extensive data supporting the city's claims was compiled in 1925 by Robert M. Searls, assistant city attorney of San Francisco, 1912 to 1917, and special counsel for the Hetch Hetchy project, 1917 to 1926. In the preparation of this article frequent reference was made to that report, and quotations are used freely.

Establishing the city's claims

Before Hetch Hetchy construction began, conflicting interests on the upper Tuolumne River were eliminated by the purchase of the John Hays Hammond rights and by the condemnation of the patented land in the Poopenaut Valley owned by the Yosemite Power Co. This eliminated all important ownerships, other than those of the federal government, above the city's proposed diversion for Hetch Hetchy and Lake Eleanor storages. The city's filings for appropriation of water were made from 1901 to 1912.

The city's rights are based on the Raker Act (passed by Congress in 1913) which gives the city rights-of-way over public lands in the watershed and imposes a condition (which San Francisco recognized and accepted) that the city respect certain rights of the Turlock and Modesto Irrigation Districts as then constituted or after enlargement for a supply to a maximum of 300,000 acres. The irrigation district's rights are defined in the Raker Act as 2,350 sec.-ft. of the natural daily flow of the Tuolumne River "when it can be beneficially used," and 4,000 sec.-ft. for combined diversion and storage during the 60-day period immediately following April 15 of each year.

FIG. 17—RED MOUNTAIN BAR SIPHON across the Tuolumne River Canyon. The 9½-ft. steel pipe is armored with heavy concrete in the river channel. Subsequently a 30,000-hp. plant will use the power in the water to be released.



The two irrigation districts never have recognized the Raker Act as binding upon them in its limitations of the amount of water to which they are entitled. On the other hand, the city has claimed that the 2,350 sec.-ft. allotted actually is in excess of the maximum amount of water ever diverted and used by the districts or for which they had canal capacity at the time the city made its latest appropriation. The amount of water to which the districts are legally entitled as against San Francisco's claims never has been determined judicially. Soon after the passage of the Raker Act the Modesto Irrigation District filed suit (July 27, 1914) against the city to quiet title to its water rights, petitioning for injunction to prevent appropriation by the city. This case was transferred to the superior court of San Joaquin County, where an amended complaint was filed May 26, 1920, since which time the suit has not been pressed, neither has it been dismissed. Another suit against the city filed by the two irrigation districts in 1933 is now pending.

Numerous suits filed

In the last few years, just prior to the time when it was expected that Hetch Hetchy water would be taken out of the San Joaquin Valley for the first time, numerous suits against the city have been filed by riparian owners and others. Some 30 such suits have been entered. Certain of these claim riparian ownership to all the water of the stream. Others claim prior rights to definite quantities of water based on the doctrine of beneficial use. Still others, in the delta region, claim rights to a flow sufficient to push back the tide and prevent the encroachment of salt water into the delta. In many of the suits based on rights of the riparian lands above tidewater, of which there are some 40,000 acres below La Grange Dam (the diversion point of the two irrigation districts), the two districts are named as co-defendants. Thus the districts, long antagonistic, now have a common interest with the city in defending these suits.

On the whole, so large a number of suits would seem to present a discouraging picture were it not for well-established provisions of California law and for certain natural conditions that have arisen to supplement the supply of water to lands below the point of diversion for the irrigation districts.

First, it has been well established under California law that a riparian owner cannot sit idly by and see a municipality spend large sums for developing a source of water supply, and then at the last moment step in and enjoin the use of the works. He may, of course, file suit at any time and secure damages if damage can be proved, but precedent indicates that action at the eleventh hour is unlikely to secure an injunction that would prevent utilization of works built in good faith. The Hetch Hetchy project has been so long in construction and so widely advertised that it is believed unlikely that any riparian owner could prove ignorance of what is going on or what San Francisco intended to do.

Moreover, San Francisco has built and operated since 1923 two large reservoirs, and through them has taken into possession the waters of the stream, releasing the water through the Moccasin Creek power plant. California law makes stored water private property subject to such uses as the owner may make of it. Under this doctrine the city already has obtained prescriptive rights to the use of both Eleanor and Hetch Hetchy reservoirs and claims the right to continue this use and to divert the water stored. Rights under this claim were shown in a recent case on trial to be sufficient to supply nearly 150 m.g.d. through the recent dry period.

National Park Service Photo

FIG. 18—TYPICAL WATERSHED AREA in the high Sierra where thousands of small lakes spot the area of heavy snowfall to provide the runoff for the aqueduct.

Water supply is ample

The controversy with the two irrigation districts is yet to be adjudicated. Practically, the situation is that the amount of water which can and for over five years has been controlled by San Francisco's reservoirs on the upper watershed is greatly in excess of any diversion requirements of the city for a great many years to come. The city therefore may be expected to have for release through its power plant in late summer of each year a large amount of water that will be useful to the irrigation districts. In other words, the districts should benefit materially from the city's operations. Since San Francisco will of necessity be required to build storage far in excess of its immediate requirements, this condition always will exist until the ultimate limit of its appropriation is reached—something that will not come about until some far distant date. How long this will be may be judged from the fact that the city now uses slightly more than 50 m.g.d. from local sources and can increase this quantity by completing works already planned. Since the city's appropriations on the Tuolumne are for 400 m.g.d., it may be expected therefore that the limit of the present appropriations will not be reached until the city attains a population eight or nine times the present total.

Another point affecting the relations between the city and the irrigation districts is that in all but the driest years there is sufficient water in the Tuolumne River to supply the districts adequately and have enough left over to meet all the city's diversion requirements. The 400-m.g.d. appropriation of the city plus the irrigation claims of the two districts in their recent suit call for an annual water crop totaling about 1,500,000 acre-ft. The total annual flow of the Tuolumne has fallen below this requirement in only twelve years of the 38 in which the river has been measured.

Thus for more than two-thirds of the time the ultimate needs of both city and districts should be fully supplied, with water to spare; and of the total water used, the city's part, at full flow of 400 m.g.d., is less than 500,000 acre-ft. per annum or one-third the total water crop. In the dry years the Raker Act limitations, already accepted by the city, make it impossible for the city to receive more than a meagre quantity of water; so it will therefore be obliged to depend largely upon water stored in years of abundance—years when otherwise the water would have wasted into the ocean. The situation thus appears to be based on elements which reasonable men should be expected to use as the basis of a very practical compromise beneficial to both irrigators and to the city.

As to lower riparian owners—those below the districts' diversion—the conditions now differ materially from those existing at the time the city initiated the Hetch Hetchy project, the whole status having been changed by a new and fundamentally important legal ruling. This was a decision of the California Supreme Court, approving a constitutional amendment adopted in 1928, limiting the rights of a riparian owner to *reasonable beneficial use*. No longer can a claim to the entire streamflow be supported. Riparian owners are limited in quantity to "reasonable beneficial use."

Another important element in the present status of the lower riparian owners has been brought in by the return-flow waters which now appear below La Grange Dam. Investigations of the state engineer indicate that "40 per cent of all the water diverted from both local and imported supplies for irrigation in the lower San Joaquin Valley would be available, in the stream channels, for use on adjacent lands or for exportation to other areas." (Bulletin 29, Department of Public Works, San Joaquin River Basin, 1931, p. 99.) This return flow now amounts to several hundred second-feet and should provide water for much of the riparian area below.

The delta owners act

As to the delta owners, they claim the legal right to have sufficient fresh water kept in the Sacramento and San Joaquin Rivers to hold the saline tidal flow back forever from the delta lands, which total in area some 400,000 acres. In 1920 a suit was commenced in the name of the town of Antioch asking for a restraining order against rice growers on the upper Sacramento River. If such restraint could have been made permanent, it would have established a precedent equally applicable to the San Joaquin and its tributaries. The Supreme Court, however, on Sept. 13, 1921, reversed the order of the superior court which had granted a temporary injunction pending further examination. The plaintiffs then amended their complaint, but demurrers were interposed and were sustained. Thus the interesting question as to whether a riparian right exists on a tidal stream still remains undecided by California's Supreme Court.

After their defeat in this action, the delta owners started a new suit in the Superior Court of San Joaquin County, naming many hundred defendants and making parties to the defense the city of San Francisco, the Modesto and Turlock Irrigation Districts and practically all appropriators of water on the San Joaquin and Sacramento Rivers and their tributaries. Generally speaking, this suit, which has not been brought to trial thus far, is directed against all water diversion in the great central basin of California, comprising some 30,000 square miles.

To summarize: a review of the disputed claims and litigation shows not one legal opposition to the city carried through to final decision by the highest state court. On the contrary the general trend of court action has been to give less substance to conflicting claims; to tend to lessen (in some cases to eliminate) claims that would obstruct the city's program of developing an adequate water supply. Prominent legal authorities believe that California water law and its interpretation thus far n- der the city substantially secure aga t successful challenge of its full use o he Hetch Hetchy Aqueduct to the n struction of which it has devoted o much time and money.

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Key: Ed.—editorial; F.—filler; L.—letter to Editor; N.—news; major articles noted by page length; asterisk (*) indicates illustrated article.

Engineering News, 1910-1917

Year	Vol.	Page	Class	Subject
1910	I	74	Ed.	Vote on Bond Issues for a Municipally Owned Supply
1910	I	133	Ed.	Municipal Ownership Controversy
1910	I	659	N.	Hetch Hetchy Valley Controversy
1911	II	519	F.	Progress Toward a Municipal Supply
1911	II	717	F.	Proposal to Purchase Spring Valley Properties
1912	II	1207*	8 p.	Abstract of Report by J. R. Freeman
1912	II	1214	1 p.	Summary of Hearing Before Sec. of Interior
1913	I	530	3 p.	Army Engineers and Secy. Fisher Report
1913	I	1163	F.	Tuolumne River Water Rights Protected
1913	II	1312	1 p.	Bill Signed by Pres. Wilson
1915	I	298*	4 p.	Details of Proposed Development
1915	I	328	1 p.	Spring Valley Water Co. Properties
1915	I	833	Ed.	Summary of Struggle for Municipal Ownership
1915	II	378*	1 p.	Progress on H. H. Project
1915	II	925	1 p.	Plans for Construction Railroad
1916	I	725	F.	Work Contemplated in 1916
1916	I	1247*-8	1 p.	Profile and Construction Program
1916	II	137*	F.	Site of H.H. Project
1917	I	492	F.	Progress Note

Engineering Record, 1910-1912

Year	Vol.	Page	Class	Subject
1910	I	202	F.	H. H. Valley not to be used for reservoir
1912	II	115	F.	H. H. Valley Water Supply
1912	II	288	2 p.	Proposed H. H. Water Supply

Engineering Record, 1913-1916

Year	Vol.	Page	Class	Subject
1913	I	225	Ed.	The H.H. Case
1913	I	253	Ed.	H.H. Water Supply
1913	I	334	L.	H.H. and Groundwater Supplies (Rudolph Herring)
1913	I	420	L.	San Francisco's Mountain Water Supply (Zumwalt, O'Shaughnessy)
1913	I	479	L.	S.F.'s Water Supply (Collins & Herring)
1913	I	620	L.	Soft Mountain Water (O. J. Todd)
1913	II	113-4	Ed.	Drivel About H.H.
1913	II	224	L.	Opposition to H.H. Water Supply (E. N. Bryan)
1913	II	282-3	Ed	Erroneous Statements Regarding H.H.
1913	II	708	Ed.	H.H. Passes into Political History
1914	II	206	F.	Review of S.F. Water Situation (M. M. O'Shaughnessy)
1915	I	446	Ed.	S.F. Votes on Spring Valley Purchase
1915	II	60	N.	S.F. Wins Point in H.H. Case
1915	II	242	N.	Differences Over H.H. Construction Adjusted
1915	II	227	N.	Plans for H.H. Railroad
1915	II	553	N.	Rush Plans for H.H. Work
1915	II	643	F.	Sale of $2,000,000 H.H. Bonds Approved
1916	I	16*	2 p.	Work on H.H. Water Project Begins
1916	I	196	N.	R.R. Commission Asked to Value Spring Valley

Engineering News-Record, 1917-1934

Year	Vol.	Page	Class	Subject
1919	I	574	Ed.	Greater H.H. Activity Planned
1919	I	730*	F.	Inclined Railway for Construction Materials
1920	I	301	N.	Purchase of Spring Valley Water Co. Proposed
1920	I	498	Ed.	H.H. Delay Threatened (on bond sales)
1920	I	649-0	Ed.	New Plans for H.H.
1920	II	815	N.	Financing Construction
1920	II	1157-8	F.	Spring Valley Property Valued at $37,000,000
1921	I	270	F.	Mountain Division Progress
1921	I	305	1 p.	Spring Valley Purchase Recommended
1921	I	483	N.	Spring Valley Purchase Vote Fails
1921	I	525	N.	Spring Valley Asks Rate Increase to Extend Works
1921	I	1015	N.	Strike Ends
1921	II	913	N.	Funds Available for Mountain Division
1922	I	751	N.	Spring Valley to Bring 24 M.G.D. Over $4,000,000 Conduit

Power Development:

Year	Vol.	Page	Class	Subject
1920	I	650	Ed.	H.H. Power Situation
1921	II	209	N.	Power to be Wholesaled
1922	I	462	N.	Power House Equipment
1922	I	803	N.	Contracts Awarded on Power-Plant Equipment
1923	I	849*	F.	Moccasin Creek Penstock Progress
1923	II	490	N.	H.H. Power Distribution Question in Limelight
1924	II	858*	3 p.	Moccasin Creek Penstock, Method of Construction
1925	I	903-4	F.	Moccasin Creek Penstock, Saddles Have Paper Joint
1925	II	78	N.	Moccasin Creek Penstock, Burst by Excessive Pressure
1925	II	189*	1 p.	Moccasin Creek Penstock, Wye Design
1925	II	236	N.	Moccasin Creek Penstock, Damage $50,000
1925	II	660-1	Ed.	Another Penstock Lesson
1925	II	666*	2 p.	Data on Moccasin Penstock Rupture

Tunnels:

Year	Vol.	Page	Class	Subject
1917	II	483	Ed	High Bids or Low Estimates (on Tunnel Bids)
1917	II	522	N.	Tunnel Bids 46 Per Cent Higher Than Estimate
1918	I	72	F.	Progress on H.H. Tunnels
1920	I	579	F.	Completed for $65 a Foot
1920	I	885	N.	Four Bids Received
1920	I	932	N.	Contract Let
1920	II	331	N.	H.H. Tunnel Progress Totals 3 Miles
1920	II	429	N.	Subcontracted
1921	I	701	N.	Contract Relinquished
1921	II	123	N.	H.H. Tunnels Advance 2780 Ft. in June
1921	II	464	N.	Rate of Progress in H.H. Tunnels
1921	II	626	N.	H.H. Tunnel Progress for September
1921	II	689	F.	Equipment Assembled
1921	II	833	N.	H.H. Headings Advance 4060 Ft. in October
1923	I	848	F.	Tunnels Near Completion
1923	I	978	N.	Tunnel Holed Through
1923	II	995	N.	Last Section Holed Through
1924	II	1010	N.	Tunnel Work Stopped
1925	I	350*	4 p.	Placing Concrete Tunnel Lining (W. F. Webb

Dams:

Year	Vol.	Page	Class	Subject
1919	II	244	N.	High Dam for H.H. Project
1919	II	292	N.	H.H. Dam Bids Accepted
1919	II	447	Ed.	Lake Eleanor Dam
1919	II	464*	5 p.	Fundamentals in Multiple-Arch Design (R. P. McIntosh)
1920	I	59	N.	Dam Concreting to Start
1921	I	1135	N.	Ready to Pour Concrete at H.H. Dam
1921	II	222*	3 p.	Excavation for H.H. Dam Foundation
1922	I	352*	2 p.	Cement Handled in Bulk on H.H. Dam (N. A. Eckart)
1922	I	973*	1 p.	Concreting Progress on H.H. Dam
1922	II	464*	5 p.	Plant and Program on the H.H. Dam
1922	II	1073*	3 p.	Methods of Constructing Priest Dam
1923	I	685 734 760	N. F. L.	Discussion Re Changing H.H. Dam Name
1923	I	741*	2 p.	O'Shaughnessy Dam Completed
1924	I	379*	F.	Priest Dam Completed

Chronological List, 1923 to 1934:

Year	Vol.	Page	Class	Subject
1923	II	100*	2 p.	Building a 9-Ft. Siphon (N.A. Eckart)
1923	II	517	F.	Water Pure Enough for Storage Batteries
1923	II	558	F.	Four Years to Complete Project
1923	II	770	F.	Boating on H.H. Reservoir
1924	I	911	N.	Total Cost to be $78,000,000
1924	I	992	N.	Law Suit Over Pipe Contract Award
1924	II	68*	1 p.	Trench Backfilling Machine (N.A. Eckart)
1924	II	118	N.	Irrigators Aided During Drought
1924	II	559*	F.	H.H. Reservoir Shore Line
1924	II	645	N.	Bond Issue of $10,000,000 Approved
1924	II	887	N.	Peninsula Water District Proposed
1924	II	926	N.	Discontinuance Order Enjoined, Work Proceeds
1925	I	1021*	3 p.	Present Status of Construction and Work Yet to be Done
1926	I	84	F.	Status at End of 1925
1926	I	434*	5 p.	Pipe Line Across S.F. Bay
1926	I	867	F.	Progress on the Project
1926	I	909	F.	Leakage Tests on Newark Slough Pipe
1926	II	480	N.	Transbay Pipe Line in Service
1927	I	62	F.	Status at End of 1926
1927	II	46	Ed.	Spring Valley Purchase Defeat
1928	I	81	F.	Status of H.H. Project to Date
1928	I	417	N.	S.F. to Vote Again on Water-System Purchase
1928	I	604	N.	S.F. to Vote on Two Water-Bond Issues
1928	I	614*	3 p.	Construction Progress on H.H. Aqueduct
1928	I	709	N.	S.F. Votes to Buy Spring Valley Water Co.
1928	II	969	N.	16-Mile Foothill Tunnel Holed Through
1929	I	171*	1 p.	Progress on H.H. Water-Supply Tunnels
1929	I	238	F.	Progress on H.H. Water-Supply Project
1929	I	793*	2 p.	Cableway Carries 5-Ton Loads on 2,295-Ft Span (L. W. Stocker)
1929	II	434	N.	Only San Franciscans to Be Employed on H.H
1929	II	439	Ed.	A False Move (on Employment Policy)
1929	II	937	F.	H.H. Water to be Delivered in 3 Years
1930	I	405	1 p.	Pipe Lines of the H.H. Aqueduct (M. M. O'Shaughnessy)
1930	I	635	Ed.	Applied to Water
1930	II	863	N.	Emergency Water Supply for San Francisco
1931	I	96*	5 p.	H.H. Tunnel Construction
1931	I	457	N.	Delivery of Emergency Water to S.F. Begun
1931	II	189	N.	Emergency H.H. Pipe Line Planned for S.F.
1931	II	811*	4 p.	Wrapping a Cement Coating on a 66-in. Steel Pipe
1931	II	864	N.	Contract Awarded for H.H. Emergency Pipe Line
1932	I	715	Ed.	Finishing a Long Job
1932	I	931	N.	H.H. Bonds Sold, Contract Undecided
1932	II	142	N.	City Undertakes Completion of H.H. Tunnels
1932	II	654*	3 p.	Portable Aggregate Plant for H.H. Tunnel
1933	I	701*	4 p.	Hazardous Tunneling on H.H.
1933	II	107*	4 p.	Lining the Coast Range Tunnels
1934	I	60	N.	Coast Range Tunnel Holed Through
1934	I	406*	F.	Special Inspection Car for H.H. Tunnel

New Engineering Achievement In the Western States

From an Editor's Notebook—II

The great Western construction works now building are distinguished by excellence of technical performance—Boulder Dam's precision of progress typifies what geologists, manufacturers, engineers and contractors are doing to advance the art

Portland, July 3, 1934

FIRST IMPRESSIONS of the unprecedented group of engineering construction works now going on in the West are inevitably dominated by their size. At the start, one's imagination is most strongly stirred by their great dimensions and staggering cost figures; by the fact that the Colorado River Aqueduct of the Southern California group of cities is 240 miles long, includes 91 miles of rock tunnel, and will cost $200,000,000; that the Golden Gate span is one-fifth longer than the 3,500-ft. George Washington span across the Hudson; that, roughly, 100,000,000 yd. of earth will go into Fort Peck Dam. But as was said in reporting this impression a few weeks ago, the excellence of the engineering that is being applied to these works soon comes to impress one even more powerfully.

An index of progress

The most brilliant example is Boulder Dam, farthest advanced and best known. That undertaking, which is now well past its major difficulties and is moving along toward completion with machine-like precision, stands out against a background of exhaustive preliminary investigation, exceptionally thorough study of design and field problems, a wide range of technical research and fine generalship in the construction attack. But the other big projects are of the same high character and have a like background. Each, according to its kind and size, reveals a quality of engineering and construction that will make them a reference point from which the accomplishments of the next decade must be measured.

A simple index of the progress already recorded is found in the concreting at Boulder Dam. Comparing it with the best work of five years ago, either in procedure or in results obtained (uniformity, strength, density and freedom from cracking), it represents almost a new art. Most of the advance is to be credited to the elaborate research and test program that preceded construction (and in part still continues). Its influence in turn gave an impetus to concrete practice everywhere, and Boulder Dam is by no means an isolated example of improvement in concrete. Witness the strong and dense concrete put into pressure-siphon pipes 12 ft. in diameter on the Metropolitan Water District aqueduct and the glassily smooth concrete obtained by the city of Seattle in precast seawall slabs, for which a crushing strength of 7,600 lb. per sq. in. at 28 days is reported.

The Boulder Dam results also reveal opportunities for further advance. In the crushing tests of the concrete cylinders included in the research program, up to 36x72-in. size, the gravel particles and cobbles always broke or split clean from the mortar on their lower sides, while their top sides adhered tightly to the mortar. Correspondingly, polished vertical sections of similar cylinders showed a seam or separation between the mortar and the bottom of each stone, though at the top of the stone no separation could be detected. If further study shows how this condition can be eliminated, concrete may be made even stronger and better than today.

Another index of construction progress is the depth of the open-caisson piers of the San Francisco-Oakland Bridge, some 230 ft.; still another is the successful diving to depths of more than 200 ft. done both here and at the Golden Gate Bridge. At the former the diver inspected the final foundation bottom before concreting, while at Golden Gate he checked up the features of the underwater topography around the south pier site. In the Golden Gate work the diver carried a telephone, moved under instructions from the surface and reported all his observations for stenographic record, to guard against mistakes in interpretation or errors of memory.

Size creates new problems

In part, the very size and difficulty of the undertakings account for the excellence of the engineering and construction. Thus, the problems growing out of the dimensions of Boulder Dam led to the block or column construction and the cooling and grouting practices followed there, though it has developed that heating and shrinkage difficulties also affect smaller masses of concrete. (Extensive grouting had to be done at Owyhee and Pardee dams and elsewhere after completion, to remedy cracking due to these actions). Size also sets the problems at Grand Coulee Dam, where it is necessary to carry the foundation to a depth of 160 ft. at one point, handle a river whose maximum summer flow exceeds 500,000 sec.-ft., excavate 11,000,000 yd. of earth, and place 3,500,000 yd. of concrete, about three-fourths as much as will be contained in Boulder Dam. And when the high dam is built around the low dam now authorized, it will add another 7,000,000 yd. of concrete! In the same way size is the essence of the Fort Peck problem.

Naturally, difficulties always accompany a big project. When the Metropolitan Water District of Southern California undertook to go to the Colorado River, 240 miles away, for an adequate and secure supply of water, it had to carry its aqueduct across the principal active fault of the region, and the engineers therefore were forced to find means of building a fault-crossing that would be reasonably proof against dislocations and that could be quickly repaired after earthquake disturbance. The supply of a large countryside with a population of more than two and one-half millions depends on their success.

Men and organizations

But there is more than size and difficulty to the story of excellent performance. After all, it is the men and organizations back of the work who determine its quality, and on these current Western projects the caliber of the men and organizations is remarkably high, as is also their energy and enthusiasm. As a matter of fact, they are picked men, and they work under unusually able leaders; they are further inspired by the character of the problems which they have to solve. Probably the best experience to be found in the country has been assembled.

The engineering staff of the Reclamation Bureau, long noted for its ability and its seasoned experience, has now added to itself many specialists qualified to deal with particular details. The army engineers at Bonneville and Fort Peck have built up organizations of unusually able men as working staff and consultants. The San Francisco bridge organizations center around men who did the responsible work on half a dozen of the largest bridges, since before Camden. The M.W.D. aqueduct organization, from Frank Weymouth down, is made up of men seasoned on big Western construction undertakings, in reclamation or elsewhere. In short, the caliber of the human element of the projects matches that of the enterprises themselves.

One of the notable things about all these projects is the thoroughness of the preliminary investigations on which their construction is based. Few engineering works have been so carefully studied in their technical aspects. Precise geological study is a typical item of the care in planning that marks all the projects. It is interesting to find that geologists are a regular part of the staff in the advance planning. Prominent among them is Prof. Charles P. Berkey of Columbia University, known the world over for his Gobi Desert studies but, among engineers, known even better for his investigations in connection with the Catskill Aqueduct, a model of predetermination of ground conditions.

It is practice on all of the projects to have a geologist continuously attached to the work until all critical rock and soil problems are solved. Care in the geological studies was peculiarly important at Bonneville Dam, whose site is bordered on one bank by an ancient rock slide miles across and on the other bank by a recent earth slide, still moving; it was vital to make sure that the dam would not be built on weak slide rock. In the case of the Seminoe and Alcova dams there is a resident geologist in addition to the consulting geologist; borings, drift and test-pit explorations are examined by him, and he indicates points at which further exploration is required. At Seminoe fissured granite is the reason for this; at Alcova there is a contact between sound quartzite and seamy, cavernous limestone carrying large quantities of hot water from the depths of a huge overturned fold in the strata believed to be accompanied by a deep thrust fault.

The same thoroughness in geological predetermination of conditions marks all the other projects. Geologists were in close attendance on the Bay Bridge till its foundation conditions were cleared up and are still following the Golden Gate south pier work. And of course even more extensive and important geological study was necessary to assist in solving the problems of intricate rock structure, fault and earthquake conditions along the M.W.D. aqueduct.

Exploration by borings, test pits and drifts is correspondingly thorough. Six test pits and 115 diamond-drill borings, some of them nearly 800 ft. deep, explored the rock at Grand Coulee Dam site. At Seminoe and Alcova the exploration by borings and drifts was even more painstaking because of the nature of the rock, though the borings were much less numerous in view of the smaller size of these dams. The extent of drilling and exploration drift work at Boulder Dam is well known; here, also, the unusual precaution was taken of driving a tunnel through the rock under the lowest point of the foundation, to get complete assurance of the soundness of support of the great structure. At Fort Peck, finally, the exploratory work will reach the amazing total of 22 test pits, an experimental tunnel, and 620 holes with a total footage of more than 55,000 ft. (or 10½ miles!).

Thorough hydrological study finds a particularly good reason in the progressive approach to 100 per cent stream utilization in all western regions. Study of local materials also is old established practice but reaches new proportions in the case of construction works larger than ordinary local deposits can supply. Both subjects have received unusual attention on the current western projects.

Research on special problems

Experimental research is one of the most remarkable engineering features of the current work. It is in fact much too extensive and important to be fairly reflected in any brief reference, but some of the more notable items ought to be in everyone's mind.

The experimental development of a soil sampler and a test procedure that permitted accurate physical examination of the ground several hundred feet below water, preliminary to Bay Bridge foundation design, was reported by *Engineering News-Record* some time ago. The elaborate tests of single and multiple suspension bridge systems for the same structure, carried out at the University of California laboratories, have also been reported. The outcome of the model study of stresses and deflections in the Golden Gate Bridge towers, done at Princeton, still awaits full recording.

Experimental development of new forms of draft tube and scroll case for the enormous turbines at Bonneville is under way at Corvallis and promises to add fundamentally new information to what is known of turbulent flow and maximum efficiency of hydraulic prime movers. Certain of the problems of the All-American Canal, particularly the deposition and transportation of the fine silt characteristic of the Colorado River, are being studied by flume experiments at Denver. The Grand Coulee overflow bucket and the Alcova spillway are being investigated similarly. Boulder Dam, in addition to the cement and concrete researches already mentioned, was the occasion of extensive researches on models of the dam, on the penstock intake valves, on concrete cooling, on grouting of thin contraction joints and on spillway design; many of these investigations (some still in progress) led or will lead to radical changes in design.

Altogether, an unprecedented volume of precise experimental investigation is in progress, with the object of making the works as nearly perfect as possible.

Preparing for construction

Equal care and study are being given to the construction problems by both contractors and engineers. An example of what has been contributed to construction efficiency by engineers appears in the preliminary operations of the Metropolitan Water District to facilitate the work of bidders and contractors—most of the line being in remote desert country, far from settlements or means of access, lacking water, power and telephones. The district therefore built an excellent road system along the whole line, 148 miles long; a complete water-supply system feeding every camp, a power-transmission line and a telephone system. Another interesting example of the engineers' forethought as to construction problems is found at Bonneville, where the government under its contract has assumed all the risk to cofferdams and finished work that may arise during flood.

Practical trial of alternative construction method is also being used to good effect. On the M.W.D. aqueduct two large siphons are being built respectively of precast pipes (by contract) and poured-in-place conduit (by district forces), to give data for the final design specifications. At Fort Peck, where an exploration tunnel was driven into the hillside in order that bidders on the diversion tunnels might see the texture and condition of the shale, it was known that the shale would slack if allowed to dry, followed by subsequent wetting. Therefore, a waterproofing coating of the walls of the excavation was planned for; before specifying this coating a series of field trials of many different coatings was run, and from these a bituminous emulsion spray was selected as best.

The contractor's share

What contractors are contributing to the quality and efficiency of the work is no less prominent. Again the project that is furthest advanced, Boulder Dam, is the outstanding example of thorough preparation, resourcefulness, effectiveness of equipment and coordination of procedure. Efficiency in construction is also well shown by the San Francisco bridge operations. On the Bay Bridge the two groups of contractors who are putting down the foundations have registered unusual success in controlling the huge caissons against their natural inclination to get out of line and position. The difficult south pier of the Golden Gate Bridge promises to be another example of the contractor's contribution when completed, for the method now being used to build the pier and its fender ring is producing virtually a new pier design. Tower erection for the Bay Bridge brought an innovation in the form of a T-shaped crane traveling in the central compartment of the cellular tower structure.

Cofferdam construction at Bonneville and Grand Coulee will probably give further occasion for the contractors to show their skill and resourcefulness; both are in deep water and rapid current and must resist large floods. The most radical innovation in construction method, however, is promised at Fort Peck, where Mason & Walsh Co., contractors for the four 26-ft. diversion tunnels (each more than a mile long), are planning new methods of excavating and moving rock.

These scattering observations may be

summed up by saying that the group of large projects now building in the West will, when completed, be of a quality representing the best that modern engineering and construction skill can produce. They will set a precedent for future work, and probably will long remain models of precise planning and capable construction. They have already made definite advances in the art, and by the time the last of them is completed even greater progress will have been achieved.

F.E.S.

Letters to the Editor

Eccentric Rivet Connections

Sir—The article "Design Simplification for Eccentric Rivet Connections" by Abraham Frank (*ENR*, March 22, 1934, p. 380) is certainly a very interesting solution of the problem, although I believe the method used for finding the polar moment of inertia of a rivet group is somewhat involved.

In *Engineering Record* about twenty years ago there appeared a solution that gives a very short and therefore useful method of calculation. From the method shown I worked up the following example which we use for reference in designing.

N = stress on rivet in question.
R = load in lb. (resultant of two or more with various directions and magnitudes).
r = lever arm of R in inches.
I = polar moment of inertia of rivet group, $= \Sigma x^2 + \Sigma y^2$.
n = no. of rivets in group.
u = dist. from C to rivet, stress on which is wanted; u_{max} = distance to farthest rivet.
C = neutral point; center of no stress; center of rotation of gusset plate.
x_o = coordinate of point C from center of gravity of rivet group.

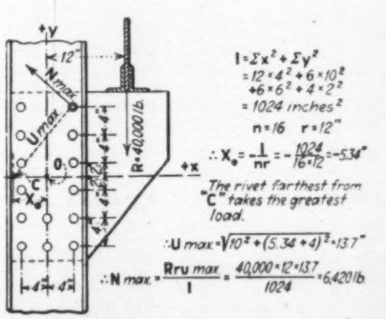
Instructions—Polar moment of inertia can be computed about axes of symmetry of rivet group, for ease of computation.

Axes for determining x_o u N etc., shall be drawn so that x-x axis is perpendicular to load R and y-y parallel to direction of load R; center of axes to coincide with center gravity of rivet group.

$$x_o = -\frac{I}{nr} \quad (1) \qquad N = \frac{Rru}{I} \quad (2)$$

Indianapolis, Ind.,
April 5, 1934

A. C. RASMUSSEN,
Chief Engineer, Insley Manufacturing Co.



$I = \Sigma x^2 + \Sigma y^2$
$= 12 \times 4^2 + 6 \times 10^2$
$+ 6 \times 6^2 + 4 \times 2^2$
$= 1024$ inches^2
$n = 16 \quad r = 12''$
$\therefore X_o = -\frac{I}{nr} = -\frac{1024}{16 \times 12} = -5.34''$

The rivet farthest from "C" takes the greatest load.

$\therefore U\,max = \sqrt{10^2 + (5.34+4)^2} = 13.7''$
$\therefore N\,max = \frac{Rru\,max}{I} = \frac{40{,}000 \times 12 \times 13.7}{1024} = 6{,}420$ lb

Sir—In Mr. Frank's article on eccentric rivet connections, the author derives an expression for the section modulus of a group of uniformly spaced rivets and gives a criterion for locating the rivet of maximum stress.

I agree with the author's statement that, "Texts with which the writer is familiar seem content to accept these equations as they stand——." The formula for the section modulus for the special case of uniform spacing of rivets is not commonly found in the engineering literature. The formula $S_x = \frac{pn(n+1)}{6}$, has however, been used in design offices for several years.

The author also states, "Thus we read in texts that 'one of the outside rivets will receive the greatest resultant of direct stress and moment stress,' leaving it to be implied that R must be computed for several outside rivets to find the one taking the maximum stress." The location of the center of motion and the criterion for the rivet of maximum stress was described in an article, "Eccentric Rivet Connections," *Engineering Record*, November 7, 1914, p. 518. (This is the same article referred to above by Mr. Rasmussen.—Editor.) The subheading of the article is, "Rivets Take Loads in Proportion to Distances from Center of Rotation Established by Equilibrium of Forces." This article gives credit for the method to Prof. P. Gullander, Chalmers' University of Technology, Gothenburg, Sweden.

A statement of this criterion will also be found in the ninth edition (1916) of "Modern Framed Structures" by Johnson, Bryan and Turneaure, Part III, p. 122-124. The location of the center of motion and illustrative examples are also given in the fourth edition (1921) of "Steel Mill Buildings," p. 132, and the third edition (1924) of "Structural Engineers' Handbook," p. 728, both by M. S. Ketchum.

F. W. STUBBS,
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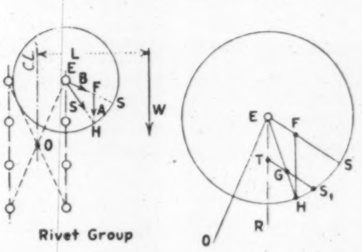
University of Illinois

Urbana, Ill.,
April 27, 1934.

GRAPHICAL determination of the strength of an eccentric rivet connection



Rivet Group

Graphical Construction

Sir—I have read with great interest Mr. Frank's article on eccentric rivet connections and note the interesting transformation of the stress formula into an equation of a circle, in order to find the rivet of maximum stress.

The following is a graphical method to find the strength of a riveted connection:

In an eccentrically loaded rivet group an extreme rivet E is investigated. It has to take the stress A due to direct shear, and the stress B due to the moment caused by the eccentricity. The resultant stress must not exceed the allowable working stress S for a rivet of that size.

As the initial step, describe an arc of radius S with its center in the rivet E. It is evident that the resultant stress must go from the rivet E to some point H on the arc if the rivet is to be stressed up to capacity.

The stress B takes a direction perpendicular to EO, if O represents the center of gravity of the rivet group. The line ES perpendicular to EO is therefore drawn. The direction of the stress A is vertical (the load is supposed to be vertical) and may be represented by a vertical line.

The problem is to find a point H on the arc such that

$$FH/EF = A/B$$

where FH is a vertical line.

Since $A = W/N$ and $B = W \times L/P$, P = section modulus of the rivets the following relation may be obtained.

$A/B = P/L \times N$ or $FH/EF = P/L \times N$

The desired point may be constructed by measuring on ER to any convenient scale $ET = P/N$. Draw TS_1 parallel to ES and measure on TS_1, using the same scale, the length $TG = L$.

Project EG to intersect the arc at H, the desired point. The distance EH represents the resultant stress on the rivet E, therefore the distance FH must give the shear on one rivet.

Hence $W = N \times A$

where W = the eccentric load, N = the total number of rivets, and A = the scaled value of FH.

If the radius ES were made equal to $N \times S$, then the distance FH would represent the total shear on all the rivets, and the expression for the eccentric load would be $W = A$.

It will be noted that the same diagram can be used for different eccentricities, as the distance TG corresponds to the eccentricity L. Thus the change in the strength of a connection for different eccentricities varies with the length of FH, with F determined by ES and H determined by the arc SR.

East Orange, N. J.,
April 17, 1934.

ODD ALBERT.

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August 2, 1934

A Quarter Century's Work

VIEWED either as a courageous municipal undertaking or as a broadly conceived and ably executed engineering project, San Francisco's Hetch Hetchy water system is entitled to a place of distinction. Few cities have surpassed the metropolis of the Golden Gate in reaching out so far to assure their future; fewer still have followed through for a quarter century in consistent prosecution of the work against difficulties and discouragements of every type—political, financial and physical. The final accomplishment of bringing the water into the city's mains is therefore something in which the city may fairly take pride. It also marks a noteworthy achievement of engineering skill, and made large contributions to the advance of the technical art. Its great dam, its difficult tunnels and siphons, were pioneer undertakings on which many later projects drew for inspiration and precedent.

A Last Hurdle

TO REALIZE the full protection and long-time assurance that the Hetch Hetchy supply offers, San Francisco has one more hurdle to surmount. The remaining obstacle lies in the lack of sufficient reservoir capacity within the city. At present the aqueduct terminates in storage reservoirs some 20 miles south of the city, down the Peninsula, where there is capacity for a three years' supply. But under emergency conditions this supply may not be able to reach the city. Should the mains that carry water from the terminus of the Hetch Hetchy Aqueduct at Spring Valley Reservoir be severed by earthquake or other accident, the city would be in a serious situation, for it now has reservoirs within the city that provide for only a few days' supply. The gravity of the need for more city storage has been clearly recognized, and additional distribution reservoirs are being built; but they are wholly inadequate to provide the necessary safety margin. With its mountain supply coming in, San Francisco can no longer afford to neglect the need for more local storage.

The Drought Continues

REPORTS FROM THE PLAINS STATES show that the severity of the drought was but little relieved by the scattering rains of the past week, and that the losses from water shortage and heat are even more serious than seemed probable two weeks ago. Thus events lay still greater emphasis on water study and conservation with a view to making the regional water resources fully available for even extreme emergencies. Conditions are most severe in the rural areas, and the work of locating and drilling emergency wells, begun in some sections more than two months ago, continues with increasing energy. The distress accompanying the crop and stock failure is certain to make next winter's employment and relief problem much greater than has heretofore seemed likely. Planning ahead for relief through constructive work operations is therefore an important next step as soon as the immediate urgency of providing water is over. It warrants active cooperative study by city, state and county officials. With timely preparation it should be possible to provide employment more effectively and with less disorganization than was the case a year ago.

Self-Government or Dictation?

Is the NRA moving toward the end of its career? Its erratic application of the Recovery Act, its growing disorganization and the popular hostility that is visibly rising are signs that its usefulness is nearly over. Now comes a clash with the steel-fabricating industry, growing out of an astonishing piece of bad faith on the part of the NRA—which first agreed with the industry on a code and then surreptitiously changed it in vital respects before declaring it effective. The fabricators unitedly challenged this action and declined to accept the code; this decision clearly stands to their credit, and every thinking citizen will endorse their attitude. We have come to the cross-roads when the fine purposes of the Recovery Act are used to justify arbitrariness. The issue now is whether there shall be industry self-government or Washington dictation. Its outcome has been temporarily postponed, for, upon the fabricators' challenge, the NRA officials deferred the effective date of the code for a fortnight. If the NRA decides to impose a code under Sec. 3d it will be going into a new adventure, and the whole question of the legality of its actions may come to test. Such a test is sure to be constructive in clearing the question of what kind of industry self-government the Recovery Act intends.

Denver Loses

LATE REPORTS indicate that the PWA will not aid Denver in getting water from the western slope of the Rockies through the pioneer bore of the Moffat Tunnel. After ten months of negotiation marked with the PWA's characteristic legal and financial delays, the Washington officials recently notified the city that an agreement for building the works under lease contract, under discussion since January, is not acceptable, although the negotiations for months had contemplated no other basis. Before this unexpected decision the PWA's lawyers had drafted final contracts, but they were so one-sided and indefinite that no conscientious city official could accept them. In the background were other disagreements. The PWA wanted to scrap the engineering work done by the city and its consultants at large cost, and turn design and supervision over to the Bureau of Reclamation, and incidentally, for reasons of its own, wanted to place a steel pipe in the tunnel, while the city desired simply to line the bore with concrete. Apart from the usual recriminations and charges of bad faith and political delays, the case raises the issue of unprecedented and extra-legal centralization of engineering in federal hands. This threat of federal absorption of local engineering function and responsibility is indeed the most serious feature of the case. The city's position that in building works to serve its own citizens it is justified in insisting on its own engineering plan is so obviously sound that the PWA authorities in seeking to deprive the city of this right appear to serve none but political purposes. This situation and its ultimate possibilities deserve thought by all members of the profession no less than does the new example of failure of the PWA's essential purpose that the Denver case presents.

A Task for Congress

THE NEW National Power Policy Committee of the Public Works Administration has a major task before it, one that increases in magnitude as its ramifications are explored. So great is the task and of such importance to the nation that at an early date Congress must take it over, with a view to establishing a truly national policy. Nevertheless, the policy committee can do much toward laying the groundwork.

These are some of the questions that call for a definite answer: Is there to be a nationwide power policy, or is there to be one policy in the Tennessee Valley and another in the Columbia Basin? Will the government sell power wholesale or retail, and, if wholesale, will it dictate retail rates as is done by the Tennessee Valley Authority? Are promotional rates to be granted during the load-building period, the rates to be raised later to meet operating and carrying charges? Are domestic or industrial users to be favored in setting rates?

Other questions bear on the relation with existing electric utilities, especially in fields like the Northwest where the per-capita consumption already is high and the existing utilities have an excess of capacity. Will the present cooperative policy of the TVA toward privately owned utilities be made a fixed national policy to be continued there and adopted in the Northwest, or is it to be scrapped when the government finds itself with large excess capacity on its hands? And what is to be the attitude toward existing publicly owned systems like those of Tacoma and Seattle?

Again, in respect to determination of rates—are gross costs to be charged against power sales, or will large deductions be made from the cost of such plants as Bonneville and those on the Tennessee River for presumptive benefits to navigation; and will the power costs of such plants as Grand Coulee and Seminoe be burdened with the cost of irrigation canals? Will rates be based on operating costs plus overhead, interest on investment, amortization, an allowance for taxes and the building of a reserve for depreciation? Will interest during construction be included? Further, what is to be done with operating and interest costs during the load-building period? Are industries close to generating stations to be charged lower rates than those at a distance, or is decentralization to be stimulated by establishing uniform rates?

Let it be remembered that this question of power policy is new to the country, but also that it is in no sense an emergency matter, to be decided, like many emergency policies of the last eighteen months, by administrative order. Before the PWA authorities embarked on building three national power plants in the Northwest, public power administration was unknown except as a local matter. Even Boulder Dam and the Tennessee Valley plants are essentially local in influence, and only local factors needed to be considered in deciding on rates and administrative policies. With the new plants of the Northwest, however, and their close relation to each other and to a large group of public and private power networks throughout half a dozen states, a broad policy becomes essential.

It is clear that such a policy should be both sound and stable. It must rest on true data of cost and service value —not necessarily of a single plant or the present development but of the aggregate power resource of a region. It must be such as to maintain and control but not destroy existing service. It must be stable to the point of permitting reasonably assured planning for further power utilization, at the risk of laying a blight on the region involved. The future is destined to be above all a time of more intensive use of power, and the principles by which power is administered must be placed on a foundation that will be secure.

Here is a major task for Congress. The power policy committee can make the task easier and can speed its accomplishment by bringing together and analyzing the data upon which Congress must base its decisions.

Worker Unrest in Construction

FOR THREE YEARS construction employment has been low. It still is low, and especially in heavy construction a good job ought to be welcome. But it does not seem to be welcome, if the strike of a group of workers on the Midtown Tunnel in New York is any criterion. The tunnel workers have good hours and wages —PWA hours and wages, in fact—yet they strike. Wages and working conditions evidently are not the issue.

The contractor says that the strike began without notice or demand, and pickets who walk before the shaft carrying "Unfair" signs say that they do not know what union is striking or why. A union representative says that the strike is a protest against the employment of non-union laborers on the job. So the issue appears to be compulsory unionization, with the usual symptoms of regimentation by organizers and threats of a sympathetic general strike.

It is strange that workers strike when they have just found a good job and have no complaint against hours, wages or treatment. Yet this latest exhibition of worker unrest matches that in the immensely destructive strike of longshoremen on the Pacific Coast, just about to end after three months, or the Minneapolis trucking strike, or others of the current flood of strikes. Most of them center on compulsory unionization.

Out of this confusing situation two facts emerge prominently. One is that the extensive new rights granted to labor by the Recovery Act do not include the right to compulsory unionization or the right to deprive non-union men of work. The second is that the course of the NRA officials in dealing with labor relations has been such as to mislead labor into believing that it was given this right and is entitled to fight for it. A third fact ought to be noted with these—namely, that in many of the recent strikes the majority of workers desired to stay at work but were either tricked or intimidated by the minority.

To bring this strike fever to an end is as important to the workers as to industry and consumer. It is at present the most critical essential to continuation of the recovery process. Construction in particular ought to guard itself against the strike habit so that it may continue to perform its essential service of stimulating general recovery of business and industry.

But it is unlikely that the NRA will accomplish this essential result; all its actions have steadily made the labor confusion worse confounded. Nor does the American Federation of Labor promise to be of help. Its officers have shown neither the understanding nor the will to work for industrial peace; in the face of the strike battles of recent months these officers remained most often supine and helpless, when they did not aggravate the conflict. If the present labor difficulties are to be ended, it will come about through steady and sensible firmness on the part of the sound majority of labor, working in harmony with the employers, who also in the large majority are seeking for stable and mutually advantageous relations with their employees.

CURRENT NEWS

Continuing Drought Cuts Water Supplies And Sets New Low Water Records

LACK of rainfall continued quite generally over the entire central section of the country during the past week aggravating the already serious shortage in stream flow and water supplies. General statements indicate both decline and shortage of municipal water supplies with resulting restrictions and curtailment in use, but quantitative figures are not yet available.

As indicative of the present water supply situation, the following are typical: an Iowa report states "reservoirs of 25 cities and towns in the southern part of the state are being depleted at an alarming rate"; Ogden, Utah, has decreased the allowable time for lawn sprinkling from 3 to 2 hours; relief workers are building an 11-mile pipe line to supply water to drought stricken families in Jackson County, Missouri; pumps are lifting water out of Lake Tahoe in California to provide a flow in the Truckee River for stricken western Nevada farmers; Salt Lake City is sinking new wells to augment its municipal supply, and federal relief agencies are drilling scores of wells in the states west of the Mississippi to relieve the water famine and provide work.

Reduced river flows

The Colorado River, usually at flood season during the summer months, had the lowest summer flow ever recorded at the intake of the Imperial Irrigation District Canal, several miles below Yuma, Arizona, on July 24, with only 340 sec.-ft. in the stream, according to M. J. Dowd, chief engineer and general superintendent of the district. Beginning June 21, the district experienced the most severe water shortage in its history despite the fact that the entire flow of the river is being diverted. Irrigation was stopped several weeks earlier because of water shortage, and at the present time water is being hauled in trucks and railroad tank cars and cattle are being moved out of the valley in large numbers.

In the vicinity of Boulder Dam, the Colorado River is flowing only 2,000 sec.-ft. whereas the normal flow for this season of the year should be about 75,000 sec.-ft.

According to reports of the weather bureau more rivers have declined to abnormally low levels this month than in any other July since these observations were started nearly 75 years ago. Never before has there been such a general drying up of streams in July in the area all the way from the Rocky Mountains to the Appalachians. Beginning with exceptionally light snowfall last winter, followed by extreme deficiency in the usual spring rains, the rivers of the Mississippi system have been progressively declining since early spring. For example, the Mississippi River at St. Louis has had record-breaking low stages for every month but one so far this year.

These low stages of the Mississippi Valley streams are particularly serious, according to M. W. Hayes, Weather Bureau, because the normal for heavy rains, from April to July, are now past. "Only a protracted period of heavy rains could bring conditions back to normal and even were these rains to come continued wet weather would be necesary to keep rivers at their normal stages as the added water would soon go to replenish the low water table of the surrounding country."

Abandonment suggested

Following a tour of personal observations through the western area, Elwood Mead, Commissioner of Reclamation has suggested a retreat of settlement in the dry-farming regions where a stored supply of water cannot be developed. The present drought has demonstrated, according to the commissioner, the hazard of depending on rainfall for agriculture in these areas.

This suggestion that the area constituting the western half of the Dakotas and corresponding areas to the south should be evacuated because of the agricultural lessons learned during the present drought has been seriously questioned by Governor Tom Berry of South Dakota, by W. A. Wilson, state administrator of federal relief in North Dakota, and by E. F. Chandler, dean emeritus of engineering at North Dakota University.

Irrigation conditions

The water supplies on many of the old reclamation projects now are inadequate, because of changing conditions, and the Bureau of Reclamation is now engaged

(Continued on p. 156)

Six Companies, Inc. Low Bidder For Parker Dam at $4,239,83

Low bid for construction of the Parker Dam on the Colorado River, the diversion unit of the Metropolitan Water District of Southern California system, was submitted by the Six Companies, Inc., builders of Boulder Dam, on July 26. The Six Companies, Inc., bid, for construction of the diversion dam and diversion tunnels, toaled $4,239,834. The only other bidder for the entire job was the Southwestern Contracting Group, Inc., with a bid of $5,496,073. There were two other bids for construction of the diversion tunnels alone, one by the West Construction Company for $887,910, the other by S. S. Magoffin Company, Inc., for $948,117.

With rights of way, appurtenent structures and power plant, Parker Dam construction cost will be about $13,000,000. The site is about 150 miles downstream from Boulder Dam. The Bureau of Reclamation will build the dam with funds furnished by the Metropolitan Water District.

Work to Start on Sewage Plant at Cleveland

Completion of negotiations for PWA financing will start construction operations on the $8,999,000 sewage disposal system for Cleveland. Approval of the PWA appropriation is considered assured, although one minor requirement remained to be fulfilled.

The Hunkin-Conkey Construction Co., holder of a $1,091,000 contract for the construction of the digestion tanks, is prepared to move equipment to the site immediately, and within about two weeks' time active construction work will be under way.

Study of Construction Wage Problems To Be Made in Southern States

TO CONDUCT a first-hand study of the wage problems which have arisen in connection with the construction code as applied to work in southern states, S. W. Jones, chairman of the national construction planning and adjustment board, will make a trip into North Carolina, South Carolina, Georgia, Florida and Alabama. Mr. Jones' trip is being made by direction of the board.

During May, general contractors and others engaged in construction in these states protested against the minimum wage of 40 cents per hour for common labor for construction. They submitted petition for a stay of this wage provision of the code.

Subsequently a public hearing on the petition was held in Washington, but little factual information was submitted. There was no proof offered to indicate that construction had been curtailed because of the allegedly high wage. Further, no one in the NRA felt competent to make an intelligent decision on the subject.

Subject for Adjustment Board

Under the construction industry code, the national construction planning and adjustment board was established to handle this type of problem. Following the appointment of the chairman, the board began to function early in July, and the southern wage problem was turned over to it promptly by the NRA.

In connection with this trip, Mr. Jones indicated that an early settlement of the difficulty over the southern wage question is imperative, if a return to cut-throat competition and starvation wage is to be avoided. He is confident that the members of the industry will aid his study.

His itinerary called for conferences at Charlotte Aug. 1, Columbia Aug. 2, Atlanta Aug. 3 and 4, Montgomery Aug. 6 and Birmingham Aug. 7.

Bacon-Davis Act Suspension Is Revoked by President

Because about $125,000,000 of building construction by the federal government would be left without guide to wage standards, President Roosevelt by proclamation June 30 revoked his proclamation of June 5 (*ENR*, June 28, p. 850) suspending operation of the Bacon-Davis Act, which requires payment on such government contracts of wage rates prevailing in the community. The law was suspended in the first instance on representations by PWA Administrator Ickes and Secretary Perkins that the coincident application of the prevailing wage requirement and PWA's zone wage rates had resulted in confusion.

PWA's agreement with the A. F. of L. governs only contracts financed wholly or in part by PWA allotments. It does not apply to building construction financed by direct congressional appropriation and supervised by the Public Works branch of the procurement division of the Treasury Department. Suspending application of the prevailing wage requirement consequently left the department in a quandary that resulted in restoring the act to effect, on contracts that will reach a large volume during the present fiscal year. The President's proclamation of June 30 merely stated that revocation of the proclamation of June 5 would be in the public interest.

General Markham Studies the Los Angeles Flood Problem

Seeking first-hand information on the flood control problems of the Los Angeles area, Maj.-Gen. Edward M. Markham, Chief of Engineers, United States Army, on July 25 made a personal tour of the Los Angeles and San Gabriel Rivers from their sources to the sea. Los Angeles county is endeavoring to obtain federal aid in financing flood control projects. Accompanied by E. C. Eaton, chief engineer of the county flood control district, and Maj. H. H. Strickney, General Markham traversed the flow line of the Los Angeles River from the Haynes Canyon débris basin above the town of Montrose to the river mouth, and then took up a tour of the San Gabriel River from the sea to its source.

General Construction Strike Threatened As New York Tunnel Workers Walk Out

LABOR leaders are threatening a general strike of all heavy construction workers in the New York Metropolitan area in an apparent effort to completely unionize all PWA projects within the city. Without warning or subsequent statement of grievances to the contractor, about 60 union hoist operators, blacksmiths and ironworkers went on strike last week on the Midtown vehicular tunnel under the Hudson River, which the Mason & Hanger Co. is driving for the Port of New York Authority under PWA regulations. The secretary of the hoist operators' local stated the strike was a protest against "non-union conditions." Work on the tunnel so far has not been seriously affected, as the contractor has declared open shop for hoist runners, and has replaced the strikers with non-union operators.

Sinking of the off-shore ventilation shaft caisson on the New York side has been held up pending the return of ironworkers. The contractor has stated unless the steel men return soon they will be replaced by others. From the start, the job was completely unionized except for common labor and certain classes of semi-skilled workers, all on the surface. According to Miles I. Killmer, manager of the Mason & Hanger Co., this is the same procedure used on the company's last two large projects, the Fulton St. and Rutgers St. subway tunnels under the East River, and labor representatives gave assurance that it would be satisfactory to handle the Midtown tunnel in the same manner.

Hours of work and wage scales for every class of worker on the tunnel are stipulated in the PWA agreement. Many of the scales being paid under this agreement are higher than similar union scales in New York. Jurisdiction of all underground work, including rock excavation, was given early in the progress of the job to Local 102, Compressed Air Workers Union, by J. V. Moreschi, president, International Hod Carriers, Building and Common Labor Union of America, in a ruling which excluded members of Locals 260 and 266, Drillers and Blasters Union.

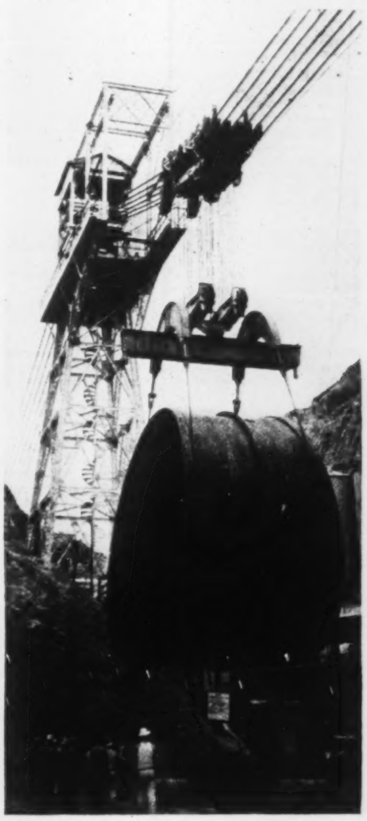
Reports state that union labor representatives are not only objecting to the use of non-union workers on PWA projects, but they are not satisfied with PWA labor classifications, which split the labor crews into many more classifications than does union organization. Consequently, declare labor leaders, many workers in the semi-skilled classifications listed by PWA are performing tasks which should be done by skilled union men.

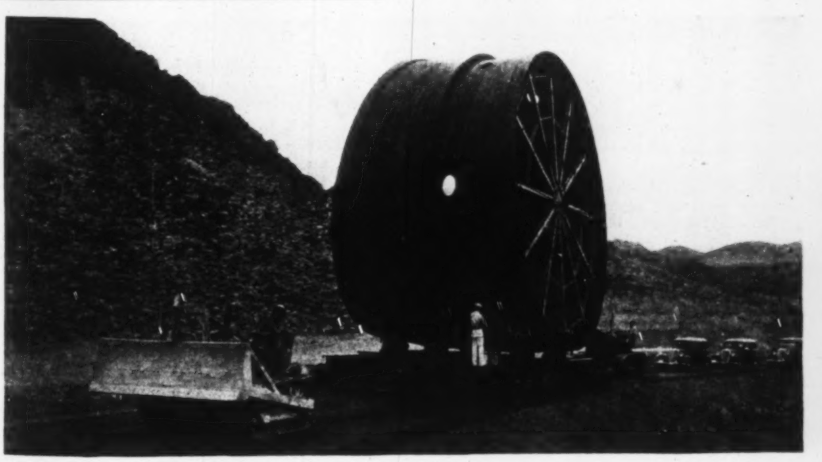
A general strike of heavy construction workers in the city would tie up the Tri-Borough Bridge, Midtown tunnel, elevated highway and New York Central elevation projects, which, at this time, are employing comparatively few men.

PENSTOCK PIPES BEGIN MOVING TO PLACE AT BOULDER DAM

Sections of the mammoth 30-ft. penstock pipe for the power development on the Boulder Dam project are beginning to move by trailer and cableway from the fabricating plant $1\frac{1}{2}$ miles back from the canyon rim to position in the tunnels which have been driven in the canyon walls. The pipes are all-welded units fabricated from flat plates at the Babcock & Wilcox Co. plant, described *ENR*, Dec. 21, 1933, p. 751. Sections of the 30-ft. pipe aggregate a length of 4,700 ft., there is also 1,900 ft. of 25-ft. diameter pipe, 5,600 ft. of 13-ft. size and 2,300 ft. of $8\frac{1}{2}$-ft. pipe.

The penstock tunnels were reviewed and illustrated *ENR*, Dec. 21, 1933, p. 757, and the record-size 150-ton cableway, shown picking up the pipe section, was described in the same issue, p. 760. The trailer was described July 12, 1934, p. 47.





Code Opposed By Institute of Consulting Engineers

THE Institute of Consulting Engineers, New York, in a resolution transmitted to Hugh S. Johnson, Administrator, National Recovery Administration, has gone on record as opposed to a code for the prosed engineers' division of the construction industry and as favoring amending Chapter I of the Code of Fair Competition for the Construction Industry so as to exclude designing from the work covered by the code's definition of the construction industry.

The American Institute of Consulting Engineers has a membership of 103, all but 10 of whom also are members of the American Society of Civil Engineers, the organization submitting the code for the professional engineers' division of the construction industry now before the NRA. The Institute has been represented on the Am.Soc.C.E. code work and approved the draft of a code submitted in revised form on Sept. 18. Its present change of view is the result of a questionnaire recently submitted to the members. While only 34 of the 103 members replied, the large majority of the replies, 82 per cent, were opposed to any code for engineers. Consequently the executive committee of the institute, on July 17, adopted the following resolution and transmitted it to the NRA.

WHEREAS, the Council of the American Institute of Consulting Engineers, starting June 22, 1934, has conducted a canvass of the membership to determine the present opinions of the individual members on the proposed code for the engineering division of the construction industry;

WHEREAS, a large majority of the replies to this canvass record opposition to the code and to any coding of engineers;

WHEREAS, the Council believes that the American Institute of Consulting Engineers is more fairly representative of the engineers who are intended to be bound by the code under consideration than is the American Society of Civil Engineers because the Institute is the only national organization of engineers which is composed of employer engineers, because its members are engaged in practicing engineering only and are not engaged in contracting, and because 90 per cent of the members of the Institute of Consulting Engineers are also members of the American Society of Civil Engineers and are representative of that small proportion of the A.S.C.E. who are not employees, and whose major interest is not contracting;

AND WHEREAS, the National Industrial Recovery Act exempted the professions, and the President's recent proclamation exempted services, from the code provisions;

NOW THEREFORE, BE IT RESOLVED:

that the Council of the American Institute of Consulting Engineers protests against the adoption of a code for professional engineers and urges the amendment of Chapted I of the Code of Fair Competition for the Construction Industry so as to exclude "designing" from the definition of the "construction industry" in Article II, Section I and so as to exclude "engineers" in the definition of "members of the industry" in Article II, Section 3.

AND BE IT FURTHER RESOLVED: that a copy of this resolution be forwarded to the Administrator of the National Industrial Recovery Act with the Council's thanks for the consideration given to President Burpee's request that action on the code be delayed until the results of the Institute's canvass could be known; and with the further information that the objections to the code expressed by members of the Institute are so numerous and varied that they are difficult to summarize, but that the members for the most part believe: that the purposes of the NRA would not be furthered in any way by the coding of engineers but that this coding might on the contrary have an adverse effect on general recovery; that minimum wages and maximum hours' requirements admittedly do not apply to those engaged in professional work; that personal character and professional ability, and not dollars and cents, must always be the principle basis of competition in engineering services, and the exemption of professions from coding in the NRA, and the recent exemption of services by the President, are sound and to the best interests of the country; that if the engineering profession is coded its dignity and standing will be impaired by its classification as a trade or industry, and its professional pride, a quality which is vital and important to the ethical practice of all professions, will be damaged; that the majority of engineers definitely do not want a code; that the cleavage which a code must necessarily produce between employers and employees, a cleavage which has heretofore been absent, would be harmful to the profession and to the public; and that most of those who have heretofore favored the code have done so only because they thought a code was inevitable and would be forced upon the profession.

For the AMERCAN INSTITUTE OF CONSULTING ENGINEERS

By F. Lavis,
Vice President

Signed by the Vice President in the absence of the President who, however, fully concurs.

Philip W. Henry,
Secretary

July 17, 1934

Grand Coulee Contract Award of $29,339,300 Speeds Project

Construction work on the Grand Coulee project on the Columbia River in eastern Washington will immediately advance to major proportions following the award of the construction contract to the Silas Mason Co., New York, Atkinson-Kier Co., San Francisco, and Walsh Construction Co., Davenport, Iowa, who submitted the low bid of $29,339,301.50 as a joint venture. Final state authorization for the development has been completed with the issuance of permits for the construction of the power and irrigation project to the Columbia Basin Commission by the state supervisor of hydraulics.

Up to the present time construction work at the site has been confined to abutment stripping, under preliminary contract, and grading operations on the government town site area.

The present major contract includes the following bid figures: River diversion and unwatering (lump sum) $3,500,000; 11,000,000 cu.yd. of common excavation for dam and power-house at $1 per cubic yard; 3,100,000 cu.yd. of concrete in the dam at $3 per cubic yard; 400,000 cu.yd. of concrete in spillway and gravity walls at $4.50 per cubic yard.

Loans Made at Record Rate of $10,000,000 Per Day by HOLC

Closing loans at the rate of more than $10,000,000 per working day, field offices of the Home Owners' Loan Corporation broke all previous records for mortgage refunding during the week ending July 13. Individual loans numbering 18,233 were concluded during the week.

The week's activity brought the aggregate number of urban home loans consummated to 375,971, amounting to $1,134,455,542. A decrease in the rate of filing of new applications for loans is taken by corporation officers to indicate that most home owners in legal distress have already made application.

Administrative Agencies Named for Construction Code

THE basic field administrative organization for the Divisional Code Authority for general contractors has been established and is functioning in all but four states, Mississippi, Montana, North Dakota and Vermont. These state administrative agencies are responsible within their respective jurisdictions for administration of the General Contractors' Code and handling the registration of construction work performed in these states. Branch offices are also operating in some states for the dissemination of information about the code and receiving applications for registration. It is the intention that the general contractors within these areas are to handle code matters with these state agencies, which will, in turn, refer to the Divisional Code Authority in Washington such matters as must be passed upon by the Code Authority. Likewise, applications for registration are forwarded by the state administrative agencies.

State agencies

The complete list of these agencies to date is as follows:

Alabama—816 Martin Building, Birmingham, Ralph A. Smallman, Chr., W. F. Jackson, Exec. Mgr.

Arizona—Phoenix, Power Conway, Chr. (c/o Phoenix-Temple Stone Co.).

Arkansas—115 N. Spring St., Little Rock, D. H. Daugherty, Chr., C. S. Christian, Sec.

California—351 California St., San Francisco, R. D. Watson, Chr., Floyd O. Booe, Mgr.

Colorado—300 A Flat Iron Bldg., Denver, Platt Rogers, Chr., James B. Kenny, Sec.

Connecticut—207 Orange St., New Haven, Burton Bartlett, Chr., W. I. Colson, Mgr.

Delaware—Chamber of Commerce, Wilmington, Thomas J. Healy, Chr., J. Huber Denn, Sec.

District of Columbia—1719 Eye St., N.W., Washington, Jas. C. Robertson, Chr., Frank J. Sheehan, Mgr.

Florida—1345 20th St., Miami, C. A. Sandquist, Chr., R. W. Reed, Sec.

Georgia—201 Red Rock Bldg., Atlanta, H. A. Beers, Chr., Hugh W. Roberts, Exec. Mgr.

Idaho—319 Robert Noble Bldg., Boise, R. H. Shoemaker, Chr., H. E. Cornell, Sec.

Illinois—Room 1819 Conway Bldg., Chicago, C. V. Burghart, Chr.

Indiana—309 W. Washington St., Indianapolis, Fred Cunningham, Chr., W. M. Holland, Mgr.

Iowa—305 Old Colony Bldg., Des Moines, J. M. Burrows, Chr., O. W. Crowley, Mgr.

Kansas—201 Nat'l Reserve Bldg., Topeka, M. W. Watson, Chr., J. W. Ballard, Exec. Sec.

Kentucky—552 S. Fourth St., Louisville, J. B. Ohligschlager, Chr., D. R. Lyman, Mgr.

Louisiana—226 Carondelet St., New Orleans, Alvin M. Fromherz, Chr.

(Continued on p. 156)

Construction Code Chapter Approved Over Objections

Chapter XVI of the Construction Code covering the activities of the Heating, Piping and Air Conditioning Contractors was approved July 25 and becomes effective August 9. Approval of this chapter concludes a spirited battle of fundamental importance to the construction industry because the functional definition of the Construction Code was given a severe test by objections raised by manufacturers of equipment which is installed by members of this division of the industry.

This chapter of the code passed through the regular course with the other supplements to the basic code at a public hearing Sept. 6, 1933, and a reconvened public hearing Nov. 20, 1933, but owing to the decision to insert PWA rates for skilled labor, following a similar decision by the plumbing contractors, this chapter was again submitted to a public hearing in May of this year when it ran into a strenuous objection by representatives of the equipment manufacturers protesting the inclusion of installation of such equipment as a part of the Construction Code. The definition, as finally determined, includes the furnishing and installing of systems for steam and hot water heating, ventilating, refrigeration, air conditioning, power piping, industrial process piping, sprinkler piping, temperature control piping and also high and low pressure boilers, stokers, oil burning units and all apparatus, appurtenances and piping systems in connection therewith conveying fluids of all kinds including products in the course of manufacture.

Exceptions noted

Because of protests, application of this definition is not to be made in any such operation when performed by a manufacturer on his own premises or by his own employees not for compensation or hire, but for such manufacturer's own use where confined to repair and maintenance items chargeable to operating expense and to minor items of replacement chargeable to capital expenditure. Also, the provisions of the chapter do not apply to supervision by supervisors and specially trained technicians at the site in connection with installing a manufacturer's product, provided such services are required to safeguard the manufacturer's responsibility for the performance of his product.

The order approving the chapter includes a condition that the Administrator may review or reconsider the skilled labor minima at any time within a period of 180 days; also, that he may grant such stay or exception therefrom as he may determine is necessary within any region or locality where undue hardship is imposed upon employers or employees. Further, a string is attached to the approval of a provision of fair trade practice regulations prohibiting selling below estimated cost, and defining estimated cost as the sum of various direct and indirect expenses applicable to the job, and not less than 12½ per cent for overhead. The Administrator may review or reconsider such provisions within 90 days after the effective date.

Approval of this chapter does not settle finally and definitely the issue between the Construction Code and various manufacturers' codes, since several of these codes directly, or by inference, include installation of the manufactured product.

New Building Group Proposed Near Mall In Washington, D. C.

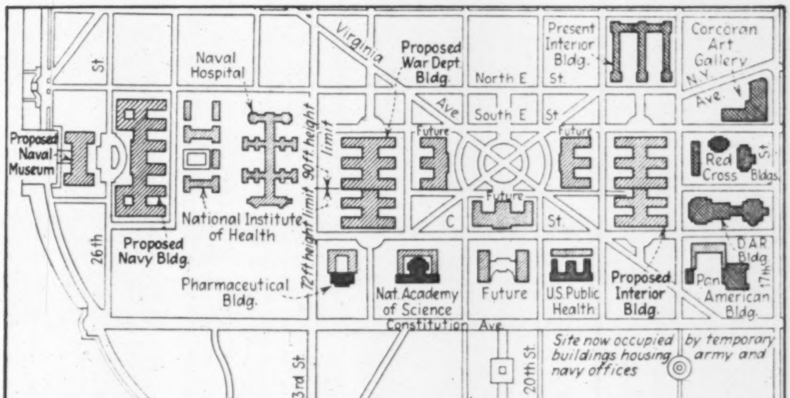
A NEW tentative development plan for government building to the north of the west end of the Mall in Washington, D. C., has been proposed by the National Capital Park and Planning Commission. The area, officially designated as the "Northwest Rectangle" includes proposed sites for the new Interior Department building, a new War Department building, a new Navy Department building and a Naval Museum, together with other undesignated public and semi-public structures.

Prepared to meet demands of Secretary of the Interior Ickes, who wants to start to work immediately with PWA funds to construct a new and larger Interior Department building, the plan replaces a proposal for development of the area made by Corbett-Holabird and Root, architects, some years ago. In working it out, the planning commission spread out the proposed building sites to get away from the building density now apparent in the nearly completed government-building development in the "Triangle" between Pennsylvania Ave. and the Mall. Such spreading will be aided by the fact that much of the land that the government will have to purchase is not in the congested area of the city and will be cheaper than that in the Triangle area. Except for one large brewery there are few large commercial concerns within the area.

Just off the northwest corner of the proposed site, is a large plant and several storage tanks of the Washington Gas Light Company. It is reported in authoritative circles that the gas company plans to move its facilities of its own volition if the site is developed.

In an effort to keep the proposed buildings low so that they be in conformity with the Lincoln Memorial the commission has set a 72-ft. height limit on the south side of the site and 90 ft. on the north side.

The size of the proposed buildings have not yet been decided upon as this question will be left to the various departments and the Supervising Architect of the Treasury. The Park and Planning Commission has recommended, however, that the new Interior Department be limited to 700,000 sq.ft. of net usable floor space.



PROPOSED new government building development adjoining the west end of the Mall, Washington, D. C. Existing buildings other than those of a public or semi-public nature that are to be retained are not shown.

Southern Contractor Charged With Violation of Code

John E. Whitley, president of the Whitley Const. Co., La Grange, Ga., posted a $5,000 bond on July 28 to appear for trial Nov. 5 in the U. S. District Court at Macon on charges of violating the construction code. Whitley surrendered to a U. S. Marshal on a warrant sworn following an investigation by Irwin Geiger, of NRA's litigation staff at Washington. Charges in the 70 counts filed against Whitley allege payment of wages as low as 10c. per hour for working days up to 17 hours in length. Information filed by T. Hoyt Davis, U. S. District Attorney, alleges that Whitley violated the construction code by working 35 employees more than eight hours a day and paying them less than 40c. per hour on a concrete paving job on State Route 42 between Jackson and Forsythe, Ga. The construction of the project is described as "transaction in and affecting interstate commerce" as the highway is part of an interstate route generally used by interstate vehicular traffic and common carriers. The information alleges that violation of the code constitutes an interference with and obstruction to free flow of commerce among the several states, tends to lower wage standards throughout the United States and tends to affect the construction industry by depriving its members of a fair basis of competition. If convicted, Whitley is liable to a fine of $500 on each of the 70 counts.

Administrative Agencies Named For Construction Code

(*Continued from p. 154*)

Maine—181 State St., Portland, John J. Cunningham, Chr., William H. Gill, Sec. (temporary).

Maryland—6 West Madison St., Baltimore, Geo. P. Zouck, Chr., W. McI. Wolfe, Mgr.

Massachusetts—80 Federal St., Boston, Robert A. Whidden, Chr., Bertram P. Floyd, Mgr.

Michigan—1248 Book Bldg., Detroit, H. L. Frisinger, Chr., R. A. McMullan, Sec.

Minnesota—512 Builders Exchange Bldg., Minneapolis, C. T. Naugle, Chr., R. J. Hendershott, Mgr.

Missouri—Merchants Bank Bldg., Jefferson City, L. V. Rites, Chr., E. C. L. Wagner, Sec.

Nebraska—525 S. 13th St., Lincoln, Gale Robinson, Chr.

Nevada—821 Balfour Bldg., 351 California St., San Francisco, Calif., Carl Dodge, Chr., Floyd O. Booe, Sec.

New Hampshire—208 Granite St., Manchester, George G. Sheed, Chr., H. E. Wheeler, Mgr.

New Jersey—Newark, N. J., W. R. Matthews, Chr., c/o Matthews Construction Co., Princeton.

New Mexico—Santa Fe, A. M. Spencer, Chr., Grant L. Miner, Mgr. (temporary).

New York—230 Park Ave., New York City, James L. Carey, Chr., J. E. Gibbons, Dir.

North Carolina—Box 500, Charlotte, William Muirhead, Chr., V. P. Loftis, Sec.

Ohio—201 Belmont Ave., Toledo, Thomas Bentley, Chr.

Oklahoma—c/o Oklahoma Contractors Asso., Tulsa, David E. Williams, Chr., L. S. McCaslin, Exec. Mgr.

Oregon—Couch Bldg., Portland, C. A. Schram, Chr.

Pennsylvania—Architects Bldg., 17th and Sansom Sts., Philadelphia, William Steele, 3rd, Chr., Frank Parker, Mgr.

Rhode Island—Box 882, Providence, A. W. Merchant, Chr., Thomas H. Coe, Sec.

South Carolina—Columbia, B. C. Fiske, Chr., V. P. Loftis, Mgr. (Box 500, Charlotte, N. C.).

South Dakota—Sioux Falls, Henry Carlson, Chr., L. F. Boyce, Sec.

Tennessee—1003 Cotton States Bldg., Nashville, W. F. Creighton, Chr., J. M. Farrar, Mgr.

Texas—Austin Hotel, Austin, Clarence Stearman, Chr., Don Lee, Mgr.

Utah—224-5 Beason Bldg., Salt Lake City, W. T. Reynolds, Chr., Mark Tuttle, Sec.

Virginia—Builders Exchange, 603 E. Franklin St., Richmond, John W. Russell, Chr., J. G. Earnest, Sec.

Washington—811 Exchange Bldg., Seattle (temporary), A. S. Downey, Chr., Miss B. Bidlake, Mgr.

West Virginia—810 Union Bldg., Charleston, R. E. Ritchie, Chr., P. J. Walsh, Mgr.

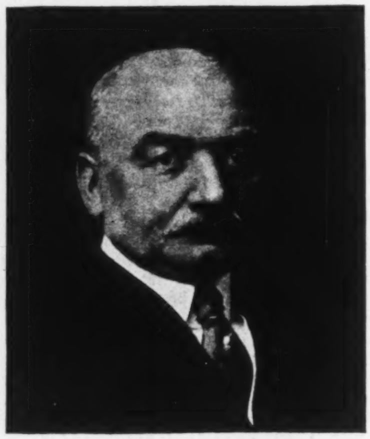
Wisconsin—601 West Wilson St., Madison, T. J. Baker, Chr., M. R. Findorff, Sec.

Wyoming—430 Boyd Bldg., Cheyenne, Charles M. Smith, Chr., W. A. Norris, Sec.

John F. O'Rourke, Contractor and Engineer, Dies in New York

John Francis O'Rourke, veteran contractor and consulting engineer of New York, died July 28 at his home in Great Neck at the age of 79, following a long illness. For half a century he had been prominently identified with major construction projects, principally in New York. One of his greatest achievements was the driving of the Pennsylvania Railroad tunnels under the Hudson River, for which he was contractor. Mr. O'Rourke was born in Tipperary, Ireland, Oct. 3, 1854, and came to this country two years later. He received his technical education at Cooper Union, and for some time taught engineering at that institution.

While still a young man he was associated with the building of the New York elevated railways. Later he was on the construction of the Haverstraw tunnels of the West Shore R.R., and then went West as engineer on several bridges in Wisconsin and Texas. From 1887 to 1890 he was construction engineer on the Poughkeepsie railroad bridge across the Hudson River, one of the great bridges of that time. In the following decade he spent several years at Amherst, Nova Scotia, working on the construction of the Chignecto Ship Canal, a project abandoned before completion.



John F. O'Rourke

Upon his return to the United States, Mr. O'Rourke became associated with Wm. Barclay Parsons in rapid transit undertakings. Later he organized the O'Rourke Engineering & Constructing Co., specializing in underground work. Besides the Pennsylvania tunnel project, this firm was contractor on many other notable structures, including several East River subway tunnels, Bush Terminal, and foundations for the New York Stock Exchange, Whitehall and Equitable buildings.

Since 1926 Mr. O'Rourke had engaged in consulting service with offices in New York. His principal interest in the last few years was the development of a precast concrete block lining for large shield-driven tunnels. The Prospect Park, Brooklyn, subway tunnel and the Ford water tunnel at Detroit were built with this type of lining. Mr. O'Rourke was a prolific inventor, and held many patents on methods and equipment for construction and marine work.

Drought Conditions Reduce Water Supplies in Mid-West

(*Continued from p. 152*)

in relieving this situation. It also is considering providing room for as many of the dry-farmers, who must find new places to live, according to Commissioner Mead. As a combined salvage and relief program, the bureau now is building numerous reservoirs and on two projects is arranging for splitting up the individual holdings to accommodate more families. By this method 500 new families can be taken care of on the Belle Fourche project in South Dakota. Also, with the construction of more laterals, increasing the irrigated area from the present 60,000 acres to 100,000 acres, the Riverton project on the Wind River in Wyoming will accommodate 500 farmers from the eastern section of the state where conditions are as bad as they are in South Dakota. Settlers on the Sun River project in Montana have been asked to cooperate in providing room for some of the families living on unirrigated land.

In Utah the Bureau of Reclamation is constructing four reservoirs at the present time. "The value of the Echo reservoir built last year on the Weber River in Utah has been proved during the present season," according to Commissioner Mead, "the new reservoir in Cache Valley is now under construction, but the people are suffering this year because this new supply of storage is not available. We are almost ready to let the contract for the reservoir at Ogden, Utah. Details for the Deer Creek Dam on the Provo River remain to be completed."

During his trip through the irrigated areas, Dr. Mead was met by many delegations requesting the building of more reservoirs. The Bull Lake Sugar District in Wyoming and Hardin, Montana, are requesting storage on the Big Horn River. The Bureau has already constructed two dams on Yellowstone River and these projects, according to Commissioner Mead, eliminate the possibility of conveying more water into the Dakotas.

Relief work

The efforts of the Federal Emergency Relief Administration indicate the extent of the privation which exists in the drought striken area. About 400,000 families are receiving practically their entire support from FERA which spent in July $20,000,000 in this territory. As part of the program to relieve the water shortage and give work to destitute, the Administration is sinking 100 deep wells in South Dakota, 50 in Wyoming and many in other states.

The Administration's plan to plant a 1,000-mile shelter belt of trees, outlined in last week's issue, page 124, has been met with varying comments. Benefit and value to be received from the plan, it is admitted, will accrue to coming generations. Immediate interest attaches to the program of other government agencies which are operating in the area with a drawing account on the $525,000,000 drought relief appropriation. There are now 806 counties included in the primary emergency drought area and so classified by the Department of Agriculture. This area covers all of the Dakotas, Nevada, Utah and part of 17 other states.

Personals

Earl J. Sherwood, president of the Great Lakes Concrete Pipe Co., Buffalo, N. Y., has been appointed a member of the Buffalo Planning Board.

Lieut. J. S. Gorlinski, chief assistant in the office of the U. S. Engineers at the Portland, Oregon, district office, has been appointed resident engineer on the Bonneville project, and took up his residence at the site Aug. 1.

George Havas, of the engineering staff of the Six Companies at Boulder Dam, has been appointed chief engineer of the Columbia Construction Co., which has the contract for the major unit of the Bonneville project, with headquarters at Bonneville, Ore.

George H. Finneran, superintendent of the Boston Water Department since 1909, retired from active service Aug. 1. He has been connected with the department since 1893, and is a past president of the New England Water Works Association.

P. B. Smith, formerly city engineer of Pittsburg, Kan., is now resident engineer-inspector for the PWA at Topeka, Kan., at present stationed at Wichita.

Fred D. Pyle, formerly engineer in the water development department of San Diego, Calif., has been named hydraulic engineer, in charge of water development, succeeding the late H. N. Savage.

Major John F. Conklin has replaced Major Fred W. Herman as Huntington (W. Va.) district U. S. engineer Major Conklin was formerly a member of the U. S. Engineer's staff at the Nashville district, but has recently been attending the Army War College.

N. B. Hinson, formerly assistant manager of operation, Southern California Edison Co., Ltd., Los Angeles, Calif., has been appointed chief engineer and chairman of the engineering committee, succeeding the late Herbert A. Barre, who died June 28. Mr. Hinson has been with the organization since 1906; he served in the capacities of distribution engineer planning engineer and was subsequently named assistant manager of operation in 1928. R. G. Boyles, formerly superintendent of distribution, has been appointed assistant manager of operation, succeeding Mr. Hinson.

Obituary

Henry C. Lichtfeld 74 years of age, building contractor of Louisville, Ky., died at his home July 24.

Harvey H. Hickman, president of the Hickman Engineering Co., Buffalo, N. Y., 45 years of age, was killed July 26 in a fall from his room in a Cleveland, Ohio, hotel. Mr. Hickman was widely known as a consultant on crane and conveyor engineering problems.

Paul B. Davis, at one time assistant city engineer of Reading, Pa., and later mining engineer in New Mexico, died in Brooklyn, July 30, at the age of 61. During the war he served with the 524th Engineers, and was cited for distinguished service.

Byron M. Allen, engineer of maintenance-of-way for the Southern Railway, and member of the Washington Board of Trade, died July 24, at the age of 45. He was a graduate of George Washington University and entered the employ of the Southern Railway shortly after graduation, and subsequently rose to the position he held at the time of his death.

CONSTRUCTION STATISTICS OF THE WEEK

With few large awards this week, engineering contracts are down to $19,825,000. Of this total $17,672,000 is public work and $2,153,000 private. Federal awards total $2,668,000. This week's total is 34 per cent higher than the average August week last year.

Streets and roads awards at $6,520,000 are 13 per cent under last week, public buildings at $5,076,000 are 18½ per cent higher than a week ago. Sewerage awards are higher at $1,670,000. Industrial and commercial buildings are both low at $710,000 and $567,000 respectively.

The larger awards include the Jamaica inspection shed for the Board of Transportation, New York, $534,000; highway awards by North Dakota, $537,000, by Ohio, $909,000 and by Texas, $1,586,000; dam, pipe line, filtration plant, pumping equipment, etc., Ponca City, Okla., $604,600; and the gas pipe line for American Michigan Pipe Line Co., Muskegon, Mich., $500,000.

CONTRACTS

(Thousands of Dollars)

	Weekly Average Aug. 1933	Weekly Average Prev. 4 Weeks	Week Aug. 2 1934
Federal Government	$600	$10,224	$2,668
State and municipal	7,300	14,816	15,004
Total public	$7,900	$25,040	$17,672
Total private	6,913	4,450	2,153
Week's total	$14,813	$29,500	$19,825

Cumulative to date:
1933 ....$508,187 1934 ....$768,799

NEW PRODUCTIVE CAPITAL

(Thousands of Dollars)

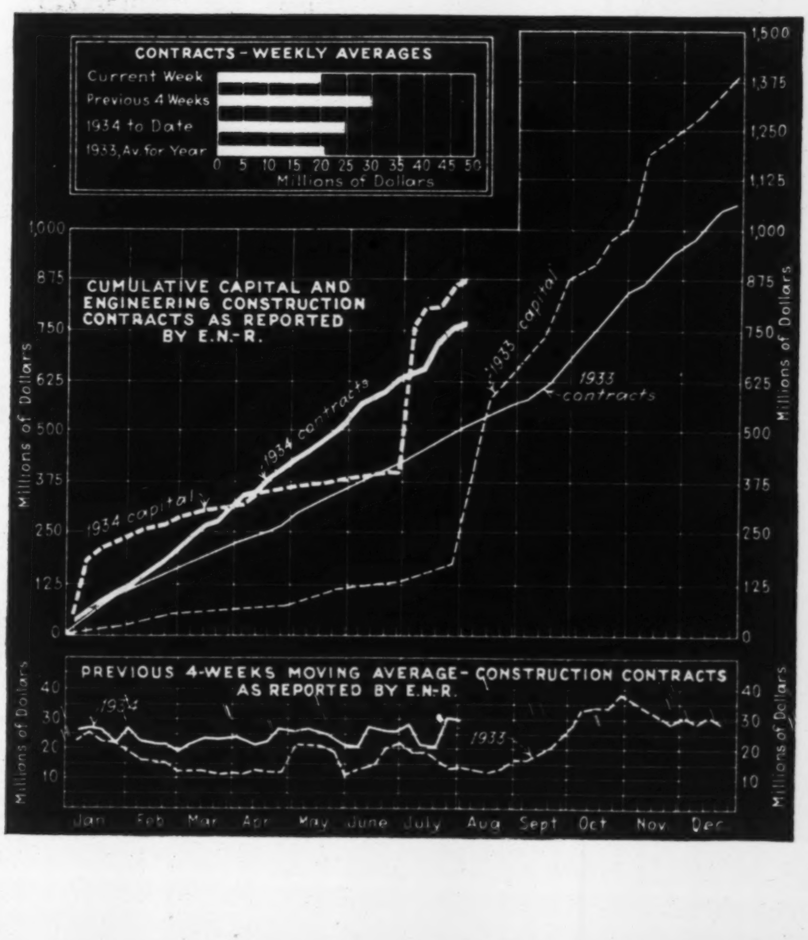
1934	Week Aug. 2	Cumulative
State and municipal....	$5,657	$213,744
PWA allotments, S&M..	......	577,214
RFC loans, S&M......	....	9,463
Corporate issues ..	......	17,063
PWA allotments, private	......	54,672
Total, Non Federal..	$5,657	$872,156
PWA allotments Federal Constr.	......	180,442
Total new capital...	$5,657	$1,052,598

Cumulative to date:
1933.... $352,116 1934.....$872,156

Note: These figures include private bonds, and stocks sold for productive purposes; state and municipal bonds for construction; PWA loans and grants to states and municipalities, including the special highway funds; PWA private loans, and allotments for Federal construction.

INDEX NUMBER

E.N.-R.-Cost	1913 = 100	1926 = 100	E.N.-R.-Volume	1913 = 100	1926 = 100
Aug., 1934..	**198.40**	**95.37**	**July, 1934...**	**128**	**56**
July, 1934...	199.65	95.97	June, 1934...	119	50
Aug., 1933..	167.00	80.27	July, 1933...	65	28.5
1933 (Av.)..	170.18	81.80	1933 (Av.)...	102	45
1932 (Av.)..	156.97	75.45	1932 (Av.)...	127	56
1931 (Av.)..	181.35	87.17	1931 (Av.)...	220	96.5



BUSINESS SIDE OF CONSTRUCTION

July Contracts Extend Gain Seven Months, 51 Per Cent Ahead

ENGINEERING construction continued upward in July with the highest volume since November, 1933. The total for the month is $118,000,000, which includes $100,161,000 in public awards and $17,039,000 in private construction. The public construction includes the high federal figure of $40,895,000 due to the award of the Grand Coulee dam main contract at $29,339,301. Private work is 20 per cent behind last year on the year to date.

On the month as a whole July is 135 per cent ahead of last year in dollar value of awards and 97 per cent ahead after adjustment is made for this year's higher cost index.

Street and road contracts for July were the lowest for the year. Public buildings almost reached the high March and April weekly averages, industrial buildings were second only to their high record in March, while commercial buildings dropped below the two preceding months and below last year.

The high federal awards in the far west give that territory the lead by a wide margin. Awards increased also in the Middle Atlantic, West of Mississippi and South territories, while New England and Middle West dropped behind last month. All territories, however, are well ahead of last year.

New Capital

The new capital curve shot up this year a month ahead of its precipitous rise last year due to the rapid rate at which PWA allotments were made from the new fund, to the allocation to states of the highway fund provided by the Hayden-Cartwright bill and to a high total in municipal bond sales.

Material Notes

Cement—Portland cement production for June was 8,786,000 barrels and shipments from mills, 8,539,000 barrels as reported by the Bureau of Mines. This is a gain in production of 12.6 per cent and in shipments of 7.0 per cent over June, 1933. The ratio of production to capacity increased to 39.8 compared with 35.2 in June, 1933, and 37.5 in May of this year.

Steel—The operating rate of steel companies having 98.7 per cent of the steel capacity of the industry dropped to an average of 26.8 per cent for the four weeks ending July 30 compared to 44.7 per cent for the last week of June as reported by the American Iron and Steel Institute. According to a report of the Institute, steel mill capacity reached its all-time high in

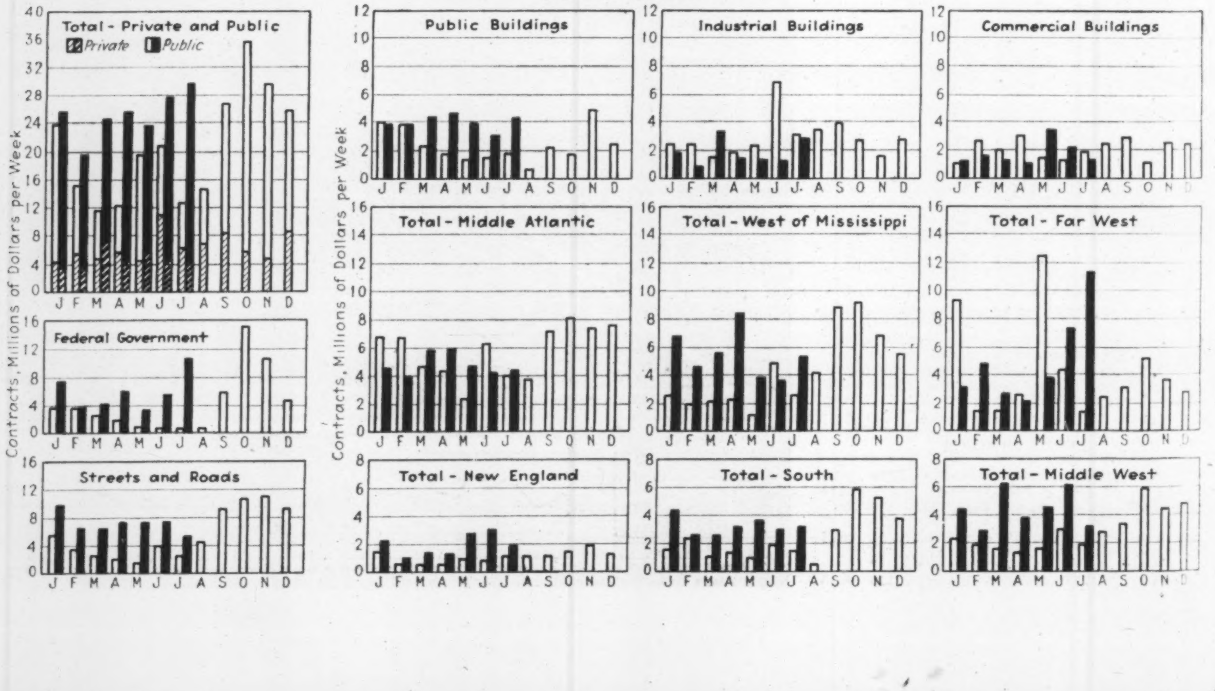
ENGINEERING CONSTRUCTION CONTRACTS REPORTED IN JULY, 1934

Four Weeks—Thousands of Dollars (000 omitted)

	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States July, 1934	United States Seven Months 1934	United States Seven Months 1933	Canada July, 1934
Public Works										
Waterworks	422	328	622	1,002	582	9,019	11,975	44,118	54,802	115
Sewers	377	305	233	1,527	2,071	253	4,766	32,853	9,923	141
Bridges, public	187	506	102	2,218	1,324	1,025	5,362	54,897	53,599	200
Earthwork and waterways	16	170	736	56	5,486	30,001	36,465	103,480	23,931	202
Streets and roads	2,899	3,304	4,194	3,335	5,257	1,750	20,739	212,923	94,750	120
Buildings, public	2,577	4,907	719	1,632	5,010	1,745	16,590	115,775	69,069	834
Unclassified, public	66	3,206	24	250	155	563	4,264	39,231	7,589	
Total public	6,544	12,726	6,630	10,020	19,885	44,356	100,161	603,277	313,663	1,612
Federal gov't. (included in other classifications)	109	2,085	1,079	251	6,463	30,908	40,895	169,363	57,569	
Private										
Bridges, private	.....	250	.....	31	25	......	306	7,018	3,684	
Buildings, industrial	224	1,710	6,064	1,721	978	508	11,205	58,752	89,969	258
Buildings, commercial	1,040	2,501	75	1,168	221	169	5,174	53,728	56,276	
Unclassified, private	18	543	250	......	200	143	1,154	26,199	32,406	70
Total private	1,282	5,004	6,389	2,920	1,424	820	17,839	145,697	182,335	328
July, 1934 (4 weeks)	**7,826**	**17,730**	**13,019**	**12,940**	**21,309**	**45,176**	**118,000**	......	......	**1,940**
June, 1934 (4 weeks)	12,058	17,179	12,199	24,592	14,412	29,553	109,993	......	......	2,390
July, 1933 (4 weeks)	4,903	16,186	5,852	7,499	10,317	5,611	50,368	......	......	2,354
Seven months, 1934	59,776	145,203	97,308	136,576	161,610	148,501	......	748,974	......	24,097
Seven months, 1933	26,986	151,171	45,071	58,353	77,685	136,732	......	......	495,998	13,998

CONTRACTS REPORTED—WEEKLY AVERAGES—1933-1934

▯ 1933 ▮ 1934



1933 with an increase of 1,191,449 gross tons, or 1.7 per cent over the previous year. The total, 69,390,625 gross tons, is the largest capacity ever reported for the industry.

June bookings of structural steel for fabrication exceeded the high record of April and established a new high point for the industry since the trough of the depression last year. Shipments held to the same high level established in May as reported by the American Institute of Steel Construction, Inc. Reports received from 83 per cent of the industry indicate that June bookings were 19 per cent larger than for June, 1933 50 per cent larger than the average monthly bookings during the last quarter of last year and 37 per cent larger than the average monthly bookings during the first quarter of 1934. Corresponding percentages on shipments are 26, 36 and 83.

Lumber—During the second quarter of 1934, lumber production as reported to the National Lumber Manufacturers Association exceeded that of the second quarter of 1933 by 11 per cent; in the first quarter of this year production was 58 per cent greater than in the similar period of 1933. During the first 6 months of 1934, lumber production exceeded new business at reporting mills by 3 per cent and exceeded shipments by 9 per cent. Production was 29 per cent above the first half of 1933 while shipments were 4 per cent less and orders 8 per cent less than the first half of 1933.

Lumber movement in July was more than seasonally low due in part to the longshoremen's strike. In the third week of July, however, orders booked at lumber mills began to pick up, showing a 20 per cent gain over the previous week.

On July 16 the Lumber Code Authority announced a new schedule of minimum cost protection prices which are approximately 10 per cent less than hitherto prevailing mill and wholesale prices for all the lumber items ordinarily used in house construction and apply to 80 per cent of the lumber output. This schedule went into effect July 20. NRA estimates that the sum of mill reductions and retail reductions reported last month should affect retail prices as much as 14 per cent.

Labor

Employment in the construction industry in New York State continued upward in May with a gain of about 28 per cent over April. Highway contractors increased employment by 72 per cent, miscellaneous general contractors by 48 per cent and general building contractors by 14 per cent. The increase up-state for all kinds of contracting amounted to 54 per cent compared with only 7/10 per cent in New York City according to the Division of Statistics and Information, Department of Labor, New York.

The Davis Bacon act, which requires contractors on public building projects to pay the prevailing wage scales in each community, was put back into operation by President Roosevelt early in July and less than a month after he suspended it by proclamation.

Carpenters in Washington returned to work on July 5 on PWA jobs and ended the strike which began May 1. They agreed to work for $1.10 an hour on present jobs that do not run for longer than a year, but they expect the PWA Board of Labor Review to sponsor $1.25 an hour on future contracts.

The Fore River bridge workers went out on strike July 10 for the second time in six weeks, charging that the decision involving wages given by the New England Regional Labor Board had not been adhered to by the contractor. The Board ruled that all qualified men who have had at least a four-year apprenticeship in their trade who are working on the pile driver or as carpenters shall be paid at the rate of not less than $1.20 an hour. The contractor on July 7 announced that carpenters, who were to receive skilled laborers' wages, would be cut to 90c. an hour; "unskilled" carpenters, 60c.; firemen, 80c. instead of $1.20; cement finishers, $1 instead of $1.25; but engineers and shapers would still receive $1.20 and 70c. respectively. A decision handed down on July 24 by the New England Labor Board ordered the return to work of approximately 75 striking employees and recommended that the contractor classify and pay his employees in accordance with the arbitrator's report. In addition to the rate for skilled workers, a rate of 60c. was set for "semi-skilled" or apprentice carpenters and 50c. an hour for unskilled laborers.

Truck drivers, shovel operators and oilers resumed work on the highway-railway contract for the Grand Coulee dam after having been out less than a week. Pending final settlement by the National Board of Labor Review, the workers will receive the increase in wages they asked, members of the arbitration board have announced. The increase was voluntary on the part of the contractors. One-third of the shovel runners were receiving $1.62½ an hour and two-thirds $1.20 before the strike. The new wage will be $1.50 for all. One-third of the truck drivers received 90c. and the remainder 80c. Their demand was 90c. for all. Dump men who were receiving 60c. will be paid 75 and shovel oilers who were receiving 75 will be paid 90. About 50 men are affected by the changes.

On the Midtown tunnel contract in New York and New Jersey building trades have called a strike in an effort to put the work on a 100 per cent union basis. Hoisting engineers, blacksmiths and ironworkers have been called out but compressed air workers and sandhogs have refused to go out. The joint labor committee of the Heavy Construction and Railroad Workers Union, following a meeting of representatives of 32 affiliated unions, postponed action on a general strike until August 1. Wage rates being paid are those stipulated in the contract which are not union rates for common labor, pipe and timber men.

* * *

ENR Cost and Volume Index

The *Engineering News-Record* Construction Cost Index for August is 198.40, a decrease of 1.25 due to the lower price of steel. The Volume Index at 128 is the highest since November last year.

INDEX NUMBER

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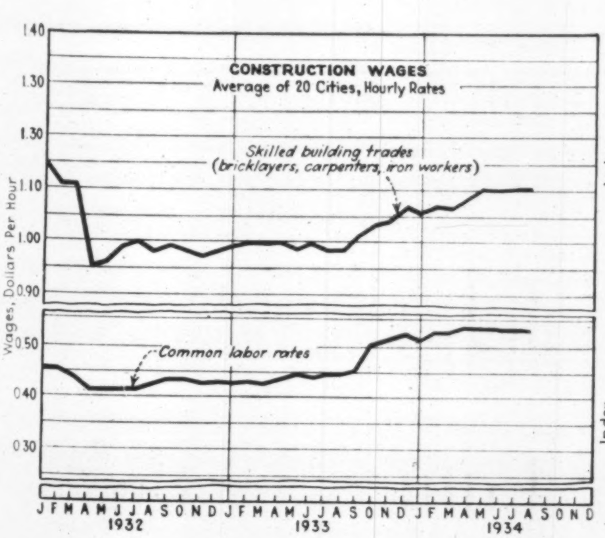

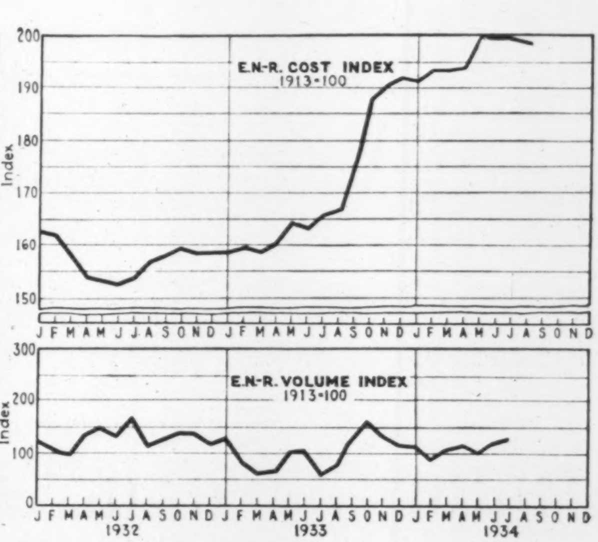

CURRENT PRICES OF CONSTRUCTION MATERIALS

CEMENT, AGGREGATES AND READY-MIXED CONCRETE

	PORTLAND CEMENT			SAND AND GRAVEL			CRUSHED STONE		CRUSHED SLAG		CONCRETE
	Per bbl., carload lots, f.o.b. city, including cost of bags			Per ton, carload lots, f.o.b. city			Per ton, carload lots, f.o.b. city		Per ton, carload lots, f.o.b. plant		Ready Mixed 1:2:4, 50c or more, delivered
	Cloth Bags*	Paper Bags	Bulk	Gravel, 1½ in.	Gravel, ¾ in.	Sand	1½ in.	¾ in.	1½ in.	¾ in.	
Atlanta	$2.79	$2.54	$2.34	$2.31	$2.31	$1.64	$1.69	$1.92	$1.80	$1.80	$9.00
Baltimore	2.66	2.41	2.21	1.80‡	2.00‡	1.25‡	1.80‡	1.80‡	2.25	2.25	7.3
Birmingham	2.55	2.30	2.10	1.75	1.75	1.40	.85	.85	.90	1.15	5.2
Boston	2.72	2.47	2.27	1.50	1.50	1.10	1.50	1.50	.....	.....	6.50
Chicago	2.85‡	2.60‡	2.40	2.60†	2.60‡	2.05‡	2.60‡	2.60‡	.....	.....	...
Cincinnati	2.57	2.32	2.12	1.30	1.30	1.20	1.80	1.80	.....	.....	6.70
Cleveland	2.45	2.20	.....	1.55	1.55	1.45	1.60	1.60	1.75	1.75	8.85
Dallas	2.45	2.20	2.00	2.00	2.25	1.45	2.00	2.25	.....	.....	6.35
Denver	3.60‡	3.40‡	.....	1.85	.....	1.25	.....	.....	.....	.....	...
Detroit	2.25	2.00	1.80	1.15	1.05	1.00	1.10	1.10	1.30‡	1.30‡	6.00
Kansas City	2.50	2.25	2.00	.75[p]	.75[p]	.65[p]	1.25[p]	1.30[p]	.....	.....	7.00
Los Angeles	2.90	2.62	.....	1.90	1.90	1.40	1.90	1.90	.....	.....	6.70
Minneapolis	2.85	.....	2.40	1.00[p]	1.00[p]	.25[p]	1.00	1.00	.....	.....	6.50
Montreal	....	1.70	.....	.....	1.60	1.45	.....	1.25	.....	.....	...
New Orleans	2.47	2.22		1.70	1.70	1.40	.....	.....	.....	.....	7.75
New York	2.90‡	2.65‡		1.50†[k]	1.50†[k]	1.00†[k]	1.75†[k]	1.85†[k]	.....	.....	8.00
Philadelphia	2.60	2.35	.....	2.00‡	2.25‡	1.80‡	1.75‡	2.00‡	1.75‡	1.75‡	8.25
Pittsburgh	2.45	2.20	1.60	1.50‡	1.50‡	1.70‡	2.25‡	2.25‡	1.25	1.25	7.00
St. Louis	2.42	2.17	.....	1.75‡	1.75‡	1.75‡	1.75‡	1.75‡	.75§	.75§	7.50
San Francisco	2.72	2.52	2.20	1.35	1.35	1.35	1.50	1.50	.....	.....	7.53
Seattle	2.95	2.70	.....	1.50†	1.50†	1.50†	.....	.....	.....	.....	5.75

*Includes 40c. per bbl. for bags, 10c. allowed for each returnable bag. †Per cu. yd. ‡Delivered. §F.o.b. Granite City, Ill. [k]Barge lots alongside dock. [p]f.o.b. plant.

CURRENT MILL PRICES CEMENT TO DEALERS, CARLOAD LOTS, F.O.B. MILL

Charge for bags not included. For cloth bags, add 40c. per bbl.; 10c. refund allowed for each returnable bag; for paper bags add 15c. per bbl., not refundable.

	Bagged	Bulk		Bagged	Bulk		Bagged	Bulk
Alpena, Mich	$1.65	$1.60	Ironton, Ohio	$1.60	$1.55	North Birmingham, Ala	$1.75	$1.70
Buffington, Ind	1.60	1.55	Iola, Kans	1.70	1.65	Richard City, Tenn	1.85	1.80
Crestmore, Calif	1.72	....	La Salle, Ill	1.60	1.55	Saginaw, Mich	1.65	1.60
Dallas, Tex. (Inc. 5c. tax)	1.80	1.75	Limedale, Ind	1.60	1.55	Steelton, Minn	1.80	1.75
Hannibal, Mo	1.60	1.55	Mason City, Ia	1.70	1.65	Universal, Pa	1.65	1.60
Hudson, N. Y	1.75	1.70	Norfolk, Va	1.76	1.71	Waco, Tex. (Inc. 5c. Tax)	1.80	1.75
Independence, Kans	1.70	1.65	Northampton, Pa	1.65	1.60	Wyandotte, Mich	1.60	1.55

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME

	STRUCTURAL CLAY TILE — PARTITION			STRUCTURAL CLAY TILE — LOAD BEARING			BRICK		LIME		
	Per M, lots of 2,000 pieces or over, delivered			Per M, lots of 2,000 pieces or over, delivered			Per M, in quantity, delivered		Per ton, in paper, carload lots delivered		
	3x12x12 in.	4x12x12 in.	8x12x12 in.	8x12x12 in.	10x12x12 in.	12x12x12 in.	Common backing	Straight hard	Hydrated finishing	Common hydrated	Pulverized or lump
Atlanta	$84.27	$89.87	$168.40	$189.50	$243.20	$277.90	$13.22	$13.50	$17.50	$12.10	$12.10
Baltimore	77.50	82.50	154.00	185.00	216.00	267.00	13.00	17.00	16.50	11.00	19.00
Birmingham	84.25	90.00	156.00	180.00	215.00	242.00	15.00	22.50	3.00§	1.75§	2.25§[e]
Boston	85.30	91.15	171.00	193.50	239.60	273.40	14.50	17.00	21.20	15.46	3.62§[e]
Chicago	66.00	70.40	132.00	......	......	......	10.20	11.20	18.00	13.40	14.00
Cincinnati	84.65	84.65	163.00	163.00	205.25	228.25	17.50	17.50	15.97	12.48	...
Cleveland	62.50	66.50	124.50	149.50	188.00	214.75	17.50	17.50	17.20k	14.50k	2.65k§[e]
Dallas	74.75	80.00	156.50	175.00	199.00	228.00	13.50	28.00	13.20	14.50	..
Denver	78.50	88.00	141.50	166.50	196.00	225.00	11.50–15.50	21.00–30.00	30.00	22.00	...
Detroit	69.50	74.10	139.00	185.70	229.90	284.65	12.00	13.00	20.00	20.00	16.00
Kansas City	63.50	66.00	120.00	160.00	165.00	198.00	11.50	20.00[m]	.60‡c	.55‡c	2.25§
Los Angeles	77.50	94.25	134.00*	188.00	232.50	311.50	11.50	14.00	18.70	.....	19.70
Minneapolis	78.25	84.00	143.00	165.00	173.00	240.00	13.10	21.00	25.50	21.00	21.00
Montreal	.....	110.00	......	......	260.00	......	15.00	21.50	23.00	13.00	...
New Orleans	58.40	62.30	116.90	159.20	194.60	......	14.00	.....	16.60	12.95	...
New York	84.00	90.00	135.00*	193.30†	238.80†	295.60†	14.00		20.80	16.00	20.80
Philadelphia	85.90	89.30	167.40	200.80	243.20	301.10	15.00	18.00	16.35	11.25	10.75
Pittsburgh	72.65c	77.45c	145.20c	164.60c	180.50c	206.25c	17.50	22.00	16.69	14.10	16.66
St. Louis	62.00	65.00	120.00	165.00	187.00	214.00	15.00	18.00	.48‡	.38‡	2.80§[e]
San Francisco	84.00	94.50	225.00	......	......	......	15.00	18.00	22.50	21.50	2.05[p]
Seattle	84.00	95.00	180.00	......	......	......	15.50[d]	15.50	30.00	25.00	3.00§[e]

*6x12x12 in. †F.o.b. Perth Amboy, N. J. ‡Per sack. §Per bbl. kLCL. [p]Per bbl. 180 lbs. cLess 5% cash 15 days. [d]less $1 cash 15 days. [e]lump [m]minimum

ROAD SURFACING MATERIALS

	PAVING BRICK AND BLOCKS			PAVING ASPHALT		ASPHALT BINDERS—FLUXES		CUTBACK ASPHALT		ROAD OILS	ASPHALT EMULSION	
	Granite per M, lots of 50,000, 4x4x8 in., f.o.b. city	Brick per M, 3x8½x4 in., carload lots f.o.b. city	Wood per sq.yd., 3½ in., 16-lb. treat. f.o.b city	Per ton, less than 80 penetration, f.o.b. city		Per gal., 80-300 penetration, f.o.b. city		Per ton, f.o.b. city		Per gal., f.o.b. city	Per gal., f.o.b. city	
				Tank car	Drums	Tank car	Drums	Tank car	Drums	Tank car	Tank car	Drum
Atlanta	$100.00	$35.00	$2.25	$18.20	$23.41	$0.0728	$0.0989	$20.45	$27.28	$0.0728	$0.105	$0.105
Baltimore	125.00	44.00	2.25	17.00	22.00	.07	.095	.08†	.115†	.....	.....	.....
Birmingham	125.00	24.00	....	18.00	23.00	0.778	.1028	.082†	.112†	.....	.06	.....
Boston	100.00	34.00	2.40	16.00	21.00	.075	.10	.09†	.12†	.075	.09	.125
Chicago	138.00	42.00	....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cincinnati	100.00	37.00	....	18.00	22.00	.09	.....	18.50	.....	.07	.08	
Cleveland	100.00‡	37.50	2.77	18.50	22.70	.0725	.085	.075†	.0875†	.0475	.09	.1025
Dallas	.....	30.50	....	13.88	20.30	.057	.082	15.65	21.76	.055	.12	.16
Detroit	.....	35.50	....	19.67[k]	24.87[k]	.....	.....	17.00	22.50	.....	.....	.....
Kansas City	.....	35.00	2.75	18.00	23.00	.065	.1005	.08†	.13†	.04	.05	.085
Los Angeles	.....	48.50	....	10.34	14.50	10.34#	14.50#	10.34	.....	.042	.06	.12
Minneapolis		.....	2.50	18.10	24.60	.098	.098	21.75	34.55	.048	.....	
Montreal	.....	110.00	....	14.00	19.66	.07	.093	19.00	26.50	.07	.125	.155
New Orleans	100.00	35.00	....	14.50	18.50	.065	.09	.07†	.10†	.....	.....	
New York	133.00§	50.00	2.64	17.00	22.00	.07	.095	.08†	.115†	.....	.085	.12
Philadelphia	115.00	45.00	2.25	15.00	20.00	.06	.....	.07†	.10†	.06	.....	.....
Pittsburgh	115.00	40.00	....	19.00	24.00	.0775	.1125	.086†	.121†	.0675	.....	.....
St. Louis	105.00	35.00	2.00	19.50	24.50	.08	.105	.09†	.12†	.04	.09	.1255
San Francisco	....	50.00	....	12.00	18.00	12.00#	18.00#	12.50#	23.00#	.04	.0575	.117
Seattle	....	47.50	....	18.00	23.85	18.00#	23.10#	15.00	.....	.03	.192[illegible]#	34.20#

Note: Paving asphalt, tank car or boat, f.o.b. Maurer, N. J., per ton, Bermudez, $25.00; Trinidad, $21.00. *Per sq. yd. †Per gallon. ‡4½x6x5½in. #Per ton §4x5x9-in. Av. [k]Mexican.

CURRENT PRICES OF CONSTRUCTION MATERIALS

IRON AND STEEL PRODUCTS—BASE MILL PRICES

	STRUCT. SHAPES-PLATE Per 100 lb., carload lots	REINF. BARS Per 100 lb., ⅝-in. billet, carload lots	RIVETS Per 100 lb. ¾-in. structural carload lots	WIRE NAILS Per 100 lb. base, carload lots	SHEET PILING Per 100 lb. base, carload lots	STEEL RAILS Per Gross Ton			TRACK SUPPLIES Per 100 lb., carload lots			
						Standard	Light	Re-rolled	Angle bars	Std. spikes	Tie plates	Track bolts
Birmingham	$1.95	$2.10	....	......	....	$36.375	....	....	$2.55	$2.40	$1.90	$3.55
Chicago	1.85	2.10	$3.00	....	$2.25	36.375	$35.00	$34.00	4.10	3.50	1.90	4.65
Pittsburgh	1.80	2.05	2.90	$2.60	2.15	36.375	35.00	34.00	2.55	2.40	1.90	3.55

IRON AND STEEL PRODUCTS—LOCAL PRICES F.O.B. WAREHOUSE

	STRUCTURAL SHAPES Per 100 lb. base price	REINFORCING BARS Per 100 lb., ⅝ in., base price		EXPANDED METAL LATH —Per 100 sq.yd., carload lots—		WELDED FABRIC REINFORCING —Per 100 s.f., carload lots—			SHEET PILING Per 100 lb. base price
		New billet	Rail steel	Std. diamond mesh, 3.4 lb	Std. ribbed 3.4 lb.	4x16 in., No. 5 & 10 wires	4x12 in., No. 8 & 12 wires	6x6 in., No 6 & 6 wires Per sq.yd	
Atlanta	$3.63	$2.48	$2.33	$21.00	$24.00	$1.60	$1.21	$0.151	$2.65
Baltimore	2.90	2.75	2.55	20.00	25.00	1.46	1.12	.137	2.70
Boston	3.52	3.03	2.2125	20.50	24.50	1.50	1.14	.142	2.30
Chicago	3.20	2.10	1.95	22.00	26.00	1.46	1.12	.137	2.25
Cincinnati	3.40	3.25	3.25	25.01	29.50	1.44	1.11	.135	....
Cleveland	3.16	2.60	2.45	22.00	25.00	1.44	1.11	.135	
Dallas	4.00	3.28	3.13	24.50	26.50	1.70	1.27	.161	2.985
Denver	3.92	3.66	....	24.50	30.50	1.70	1.27	.161	....
Detroit	3.40	2.85	2.85	24.75†	30.00†	1.48	1.13	.139	2.25
Kansas City	3.75	2.53	2.63	19.50	21.50	1.54	1.17	.145	2.65
Los Angeles	3.10	2.95	....	23.00	27.50	1.90	1.40	.18	2.50
Minneapolis	3.45	2.82	2.67	22.00	26.00	1.58	1.20	.149	2.55§
Montreal	3.50	3.00	2.80	.....	.....				3.30
New Orleans	....	....	....	19.50	23.00	1.58	1.20	.149	....
New York	3.37	2.82	2.67	20.00	22.00	1.48	1.13	.139	
Philadelphia	2.055	2.34	2.19	20.00	23.50	1.44	1.11	.135	2.43
Pittsburgh	1.80‡	2.05‡	1.90‡	19.10‡	21.90‡	1.44	1.11	.135	2.15
St. Louis	3.44	2.40	2.25	20.00	24.00	1.46	1.12	.137	2.25
San Francisco	3.55	2.475	2.35	23.00	28.00	1.90	1.40	.18	2.60
Seattle	3.55	3.50	....	....	.....	1.90	1.40	.18	...

‡Base Mill Price. Note: Shapes, bars and piling subject to quantity discounts. §Mill Price plus freight to Minneapolis †f.o.b. delivered.

PAINTS AND ROOFING SUPPLIES

	WHITE LEAD Per 100 lb. keg in oil f.o.b.	READY-MIXED PAINT Per gal., drums, f.o.b.			ROOFING SUPPLIES Carload lots, f.o.b. factory				
		Graphite*	Aluminum†	Ferric Oxide‡	Rolls, slate surfaced, 85-90 lb., per sq	Asphalt felt, per 100 lb	Tar felt, per 100 lb.	Asphalt coating, per gal	Tar pitch, 350-lb. bbl., per ton
Atlanta	$11.50	$1.60	$3.10	.....	$1.99	$1.97	$2.90	$.36	$25.40
Baltimore	11.00	1.40	2.25	$1.90	2.52	2.48	2.48	.455	23.00
Birmingham	11.50	2.35	2.35	1.85	2.25	2.10	....	35	23.00
Boston	11.00	1.60	2.50	.04½x	2.15	3.30	3.30	.4266	20.00
Chicago	11.00	1.85	2.45	1.30	1.60	1.59	1.59	.24	20.00
Cincinnati	11.00	1.40	3.00	1.55	2.40	2.39	2.39	.36	21.00
Cleveland	11.00	1.65	2.35	....	1.60	2.45•	2.45•	.38	20.00
Dallas	12.00	1.80	2.41	.....	3.15x	2.56½	2.56½	.63	36.00▪
Denver	11.75	2.55	.....	....	2.17	3.00	3.00	.50	30.00
Detroit	11.00	1.55	2.35	1.30	1.75	2.35	2.50	.37	27.00
Kansas City	11.12½	1.75	2.25	1.50	1.75	1.85	2.15	.33	26.75
Los Angeles	10.00	1.60	2.25	2.30	2.00	1.50	.....	.45	.....
Minneapolis	11.12½	....	.....	.....	1.60	1.51•	1.51•	.29	25.10
Montreal	9.40	1.70	3.45	1.65	2.00	2.62	2.02	1.40§	1.52§
New York	11.00	1.70	2.35	1.48	1.75	1.79•	1.79•	.232	22.00
Philadelphia	11.00	1.50	2.10	1.50	1.43	1.34•	1.34•	.29	20.00
Pittsburgh	11.00	1.05	1.95	.80	2.00	1.75•	1.75	.35	24.50
St. Louis	11.00	1.85	2.25	1.25	1.60	2.33	2.33	24	18.00
San Francisco	10.75	1.80	2.75	1.10–2.00	1.89	3.10	3.10	38	26.00
Seattle	10.75	.....	1.92	....	3.10	4.50	.....	.50	27.60

*New Jersey State Hwy. Spec. 120M. †ASTM Spec. D266-31. ‡80% maximum ferric oxide. §Per 100 lb. •Per roll, 65 lb. xPer lb ▪500-lb. drums.
Note. Red lead dry, same as white lead in oil, red lead in oil 50c higher.

MISCELLANEOUS ITEMS

	WINDOW GLASS Discounts from latest jobbers list, Sept. 15, 1928 Single or Double Thickness		EXPLOSIVES Per lb. dynamite delivered 50-lb. cases Gelatin	
	A quality	B quality	40%	60%
Atlanta	85%	85%	$0.215	$0.2375
Baltimore	90%	92%	.15	.165
Birmingham	88%	90%	105	120
Boston	88–10–5%	90–10–5%	.1625	.1775
Chicago	90%	92%	....	....
Cincinnati	87@10%	89@10%	.27	.29
Cleveland	89@10%	91@10%	.19	.205
Dallas	88%	90%	155	175
Denver	84@ 5%	86@ 5%	.19	.205
Detroit	87@10%	89@10%	237	255
Kansas City	89@10%	89@10%	.15	.20
Los Angeles	90%*	90@40%*	.1725†	1925†
Minneapolis	87%	89%	.17	.185
Montreal	......	......	1875	.2125
New Orleans	88%	90%	19	.22
New York	89%	91%	22	.235
Philadelphia	90	92%	....	....
Pittsburgh	90%	90%	105	.12
St. Louis	87%	89%	.13	.145
San Francisco	90%	90@30%	.1575	1775
Seattle	90@10%	90@20%	.1525	.1675

*Disc. from list Aug. 1, 1929. †F.o.b. Arsenal

CHEMICALS

Water, sewage treatment, road work, f.o.b., carlots, New York.

Bleaching powder, in drums, f.o.b. works, per 100 lb	$1.90
Calcium chloride, 77-80%, flaked, in 400-lb. drums or 100-lb moisture proof bags, f.o.b. works, freight equalized with points of competition, per ton	19.50
Chlorine, cylinders, per lb. delivered	.05½
Silicate of soda, 52 deg., in drums, f.o.b. works, per 100 lb	1.35
Soda ash, 58%, in paper bags, per 100 lb	1.20
Sulphate of aluminum, commercial, in 100 lb. bags per ton	27.00
Sulphate of copper, in bbl., per 100 lb	3.85

PILES

Prices, per linear foot, pine, with bark on f.o.b., New York; delivered from barge, 1½ to 2c. per ft. additional:

Dimensions	Points	Length	Short Leaf Barge	Short Leaf Rail	Long Leaf Barge	Long Leaf Rail
12 in. at butt	6 in.	30 to 50 ft.	$0.11	$0.155	$0.12	$0.15½
12 in.—2 ft. from butt.	6 in.	50 to 59 ft.	.15	.20	.14	.19
12 in.—2 ft. from butt.	6 in.	60 to 69 ft.	.16	.215	.15	.20½
14 in.—2 ft. from butt.	6 in.	50 to 69 ft.	.185	.225	.19½	.23½
14 in.—2 ft. from butt.	6 in.	70 to 79 ft.	.2025	.225	.23½	.29½
14 in.—2 ft. from butt.	5 in.	80 to 85 ft.	.265	.375	...	...
14 in.—2 ft. from butt.	5 in.	85 to 89 ft.	.305	.442	.....	

RAILWAY TIES

Prices f.o.b., per tie, for carload lots:

		6 In. x 8 In by 8 Ft	7 In. x 9 In. by 8½ Ft.
Boston	Oak, untreated	$1.00	$1.35
	Pine, untreated	1.00	1.35
	Pine, creosoted	1.45	2.00
New York	Long-leaf sap pine, untreated	.80	1.00
	Mixed oak, untreated	....	1.00
Birmingham	White oak, untreated	.75	1.50
	White oak, creosoted	1.40	1.45
	Southern pine, untreated *6x8x8′6′	1.00*	1.20
	Southern pine, creosoted	1.20*	1.40
Chicago	White oak, untreated	1.15	1.40
	Oak, empty cell, creosoted	1.50	1.88
	Oak, zinc treated	1.40	1.70
	Southern pine, creosoted	1.35	1.78
Los Angeles	Fir, untreated	.57	.80
	Fir, creosoted	1.75	2.50
Philadelphia	Red oak, untreated	1.00	1.50
	Red oak, creosoted	1.20	1.85
St. Louis	White oak, untreated	.90	1.35
	Red oak, untreated	.88	1.30
	Red oak, creosoted	1.25	1.85
	Sap Pine or cypress, untreated	.75	1.20
San Francisco	Douglas fir, green, untreated	.45	.63
	Douglas fir, empty cell, creosoted	1.14	1.56
Montreal	Birch or maple, untreated	1.00	1.00
	Birch or maple, creosoted	1.25	1.55

CURRENT PRICES OF CONSTRUCTION MATERIALS

WATER, SEWER AND DRAIN PIPE

	C. I. PIPE	**VITRIFIED SEWER PIPE**				**CLAY DRAIN TILE**		**CONCRETE SEWER PIPE**		**WROUGHT STEEL PIPE**			
	Per net ton, f.o.b. 6 in. and over*	Per foot, delivered, standard (‡ f.o.b.)				Per 1,000 ft., car-load lots, f.o.b.		Per ft., delivered; ASTM C 14-24		Full standard weight. #			
										1 to 3 in., Butt Weld		2½ to 6 in., Lap W	
		8 in., s.s.	12 in., s.s.	24 in., d.s.	36 in., d.s.	6 in.	8 in.	12 in.	24 in.	Black	Galv.	Black	Galv
Atlanta	$42.00	$0.225	$0.405	$1.4625	$3.25	$80.00	$128.00	$0.55	$1.60	44%	37%	42%	34
Baltimore	45.50	.24	.46	2.05	6.12	102.00	157.00	.75	2.00	....	....	....	
Birmingham	38.00	.25	.45	1.625	4.660	85.00	......	.45	1.60	53.225%	42.205%	54.45%†	43.429
Boston	47.50	.231	.4455	2.025	5.945	60.10	101.00	.49	1.85	....		....	
Chicago	46.50	.28	.54	1.98	5.60	85.00	120.00	.675	2.25	56%	45%	55%	57
Cincinnati	45.00	.224	.432	1.89	5.74	64.29	......	.40	1.40	57.33%	46.31%	58.55%	47.53
Cleveland	45.50	.203	.3915	1.665	5.125	47.25	72.00	.536	2.102	58.4%	48.4%	60.6%	49.6
Dallas	50.00	.27	.486	1.944	.....	160.00	229.00	.46	1.57	64%	55%	63%	54
Denver	58.00	.23‡	.415‡	1.73‡	.....	.....	......	....	.....	56%	45%	43%[k]	57
Detroit	46.50	.294	.567	2.25	5.125	100.00	150.00	.55	1.60	54%	42.3%	52.6%	41.8
Kansas City	48.00	.38	.58	1.95	3.90	120.00	180.00	.....	.....	....		....	
Los Angeles	46.50	.2825‡	.508‡	2.03‡	5.535‡	115.50	192.50	1.00	2.00	53.57%	43%	53%	42.51
Minneapolis	48.50	.283	.51	2.04	5.13	.....	......	.50	1.33	....	....		
Montreal	.....	.....	1.10	3.70	.....	.....	......	.....	.....	....	....	....	
New Orleans	44.00	.25	.45	1.62	.....	50.00	......	.45	1.65				
New York	45.00	.308	.594	2.64	7.38	.....		.55	2.00	51.88%[z]	40.86%[z]	53.10%†[z]	42.08
Philadelphia	43.50	.315	.6075	2.70	.....	150.00	230.00	.....	.....	52.37%[z]	41.35%[z]	53.39%†[z]	42.57
Pittsburgh	48.00	.217‡	.418‡	1.80‡	5.43‡	46.00	82.00	.75	1.75	64%	55%	65%†	56%†
St. Louis	45.00	.27	.486	1.944	3.96	85.00	172.00	.80	2.28	51.51%	40.49%	52.74%	41.71
San Francisco	46.00	.265	.477	1.908	5.22	105.00	175.00	.....	2.20	52.4%	63.4%	51.1%	64.6%
Seattle	47.50	.35	.63	2.52	....	85.00	200.00	1.50	1.60	60.3%	51.3%	65.3%	52.3%

*b. & s. class B and heavier, C/L lots. Burlington, N. J. (base) $42.00. Gas pipe and class A, $3 per ton additional, 4-in., $3 per ton additional.

Discounts from standard list for delivery from warehouse, except Pittsburgh prices are f.o.b. mill. Base price $200 per net ton List price: per ft.: ½ in., 8½c; ¾ in. 11½c.; 1 in 17c.; 2 in., 37c.; 2½in., 58½c.; 3 in., 76½c.; 4 in. $ [illegible]; 6 in., $1.92. †3½ to 6 in., [k]2½ to 3 in.
[z] Resale price to consumer, car load lots shipped from mill.

LUMBER AND TIMBER

		SHORT LEAF YELLOW PINE AND DOUGLAS FIR									**LONG LEAF Y. P.**	
		Per M ft. b.m., carload lots f.o.b. All S. L. Y. P. is No. 2 common or better and for No. 1 N. C. Box. All Fir planks No. 2 common; Fir timber is No. 1 common. Lengths up to 20 ft.									Per M ft. b.m., C.l. lots, f.o.b., merchantable grade up to 20 ft.	
		1x6, S4S	1x8, S4S	2x4, S4S	2x6, S4S	2x8, S4S	2x10 S4S	3x12 Rgh	6x12 Rgh.	12x12, Rgh.	2x12 Rgh.	12x12, Rgh.
Atlanta	Southern Pine	$18.00	$19.00	$21.00	$18.50	$20.00	$20.50	$28.00	.....	.....	$38.50	$40.00
Baltimore	Southern Pine	25.00	26.00	31.50	29.50	30.50	33.00	38.00		.....	54.00	55.00
	Douglas Fir	29.00	29.00	31.00	29.00	30.00	32.50	30.00	$30.00	$30.00	.....	.....
Birmingham	Long Leaf	21.50	22.50	23.50	19.50	22.50	23.50	39.50	.....	.....	42.25	40.25
	Southern Pine	21.50	22.50	22.50	18.50	21.50	22.50	27.75	27.75	27.75	.....	
Boston	Southern Pine	30.50	32.00	37.75†	39.00†	55.00‡	63.00‡	73.00‡	.....	.....	73.00	73.00
	Douglas Fir	31.25	33.50	38.50	40.25	40.75	41.00	44.00	44.00	44.00	.....	.....
Chicago	Southern Pine	27.00	28.00	33.50	30.00	31.00	32.50	45.00	.....	.....	54.00	58.00
	Douglas Fir	28.50	29.50	31.75	30.50	30.50	28.50	40.75	41.75	41.75	....	.....
Cincinnati	Southern Pine	32.00	32.00	32.00	31.50	35.00	35.00	42.00	.....		46.09	.....
	Douglas Fir	.....	.....	.....	.....	.....	.....	48.00	48.00	52.00	.....	
Cleveland	Southern Pine	28.50	29.50	31.00	28.00	30.25	30.50	45.00	45.00	.....	45.00	57.00§
Dallas	Southern Pine	26.25	26.25	29.02	26.27	27.92	28.72	42.44	.....	.....	47.63	55.55
	Douglas Fir	37.00	37.00	37.50	36.50	36.50	38.00	49.00	50.00	51.60	.....	.....
Denver	Douglas Fir	.....	39.00*[m]	43.50*	43.00*	43.00*	45.00*	44.50*	40.00*	56.00	.....	.....
Detroit	Southern Pine	26.00	27.50	30.00	27.00	30.00	32.00	37.00	.....	.....	32.00	43.75
	Douglas Fir	.....	.....	.....	.....	.....		43.25	44.25	44.25	.....	.....
Los Angeles	Douglas Fir	28.00	29.80	28.35	27.00	27.00	27.00	31.00	31.00	31.00	.....	.....
Minneapolis	Western Pine	44.00*	41.25*	36.25*	34.00*	35.25*	34.00*	49.25*§	.....	.....	.....	.....
	Douglas Fir	33.75*	34.75*	36.00*	32.25*	34.00*	35.25*	47.00*	50.75*	53.75*	.....	.....
Montreal	Spruce	36.00	36.00	30.00	30.00	32.00	34.50	36.00	.....	.....	42.00†	.....
	Douglas Fir	48.00	48.00	43.00	52.25	52.25	58.75	.....	....	.....	.....	.....
New Orleans	Southern Pine	26.45	27.70	32.70	27.45	30.45	31.70	43.70	.....	.....	45.20	52.45
	Douglas Fir	28.00	30.00	33.00	28.00	32.00	33.50	37.50	.....	.....	.....	.....
New York	Southern Pine	32.00*	33.50*	39.75*	35.25*	38.50*	39.75*	47.75	.....	.....	78.50*	77.25*
	Douglas Fir	.....	.....	42.00*	39.00*	40.00*	42.00*	39.00*	41.00*	41.00*	.....	.....
Philadelphia	Southern Pine	27.50	28.50	30.50	27.25	29.00	30.25	35.00	.....	.....	66.00	64.00
	Douglas Fir	.....	.....	35.50	35.50	35.00	35.00	35.00	35.00	35.00	.....	.....
Pittsburgh	Southern Pine	26.50	27.75	32.75	29.25	31.75	32.75	41.50	.....	.....	57.50	57.50
	Douglas Fir	33.50	34.50	34.50	33.50	34.00	34.25	46.25	46.25	46.25	.....	.....
St. Louis	Southern Pine	36.50*	37.50*	39.50*	35.00*	38.50*	39.00*	52.00*	.....	.....	70.00*	53.50*
	Douglas Fir	.....	.....	.....	.....	.....	.....	55.00*	55.00*	55.00*	.....	.....
San Francisco	Douglas Fir	15.00[l]	16.00[l]	17.00[l]	14.50[l]	15.50[l]	16.50[l]	21.00[t]	21.00[l]	21.00[t]	.....	.....
Seattle	Douglas Fir	22.50	21.50	21.50	21.00	22.50	22.50	20.00	20.00	22.00	.....	.....

*Delivered. †Spruce. ‡Long-leafed Y. P. §Norway Pine. [k]Northern Pine. [l]Douglas fir. [m]Native. [t]At ship's tackle.

CURRENT BUILDING AND CONSTRUCTION WAGE RATES PER HOUR

	Bricklayers	Carpenters	Structural Iron Workers	Hoisting Engineers	Plasterers	Common Labor	
						Building	Heavy Const.
Atlanta	$0.70/1.125	$0.40/.90	$0.60/1.25	$0.60/1.25	$0.50/.75	$0.30/.40	$0.30/.40
Baltimore	1.25	1.10	1.37½	1.25	1.25	.45	.45
Birmingham	1.00	1.00	1.00	1.00	1.00	.30	.30
Boston	.90/1.30	.70/1.17½	1.20	.90/1.17½	.90/1.62½	.40/.70	.40/.70
Cincinnati	1.27½	1.02½	1.20	1.07½	1.27½	.45	.40
Chicago	1.50	1.31¼	1.35	1.31¼	1.50	.82½	.82½
Cleveland	1.25	1.12½	1.25	1.12½	1.25	.72	.72
Dallas	1.10	1.00	1.12½	.75	1.25	.40	.40
Denver	.60/1.12½	.60/.87½	.60/.87½	.60/.87½	......	.50	.50
Detroit	1.25	1.00	1.25	.75/.95	1.25	.50	.50
Kansas City	1.32½	1.12½	1.25	1.12½	1.12	.50/.60	.60/.75
Los Angeles	1.10	1.10	1.25	1.10	1.25	.50	.60
Minneapolis	.90/1.20	.75	.90	.75	.90	.40	.50
New Orleans	1.00	.75	1.00	1.00	1.25	30./.40	.30/.40
New York	1.50	1.40	1.65	1.50/1.56¼	1.50	.82½	.82½
Philadelphia	.75/1.20	.60/1.20	1.00/1.20	.75/1.20	.60/1.20	.30/50	.30/.50
Pittsburgh	.50/1.00	.50/1.00	.50/1.00	.50/1.00	.50/1.00	.35/.50	.35/.50
St. Louis	1.50	1.25	1.47	1.35/1.47	1.50	.78¾	.35/.78¾
San Francisco	1.50*	1.10	1.37½	1.12½	1.25*	.62½	.60
Seattle	1.20	.90	1.25	1.12½	1.20	.60	.60
Montreal	0.70	.60	.60	.55	.67	.35	.25

Skilled Ave: (Bricklayers, Carp., Ironworkers) $1.1099. Common Ave. $0.53 *6-hr. Day

CONSTRUCTION REPORTS

WATERWORKS

PROPOSED WORK

Ark., Fort Smith—City making plans new water supply, consisting 6 m.g. filtration plant, dam, concrete reservoir, 23 mi. 27 in. pipe line. $1,600,000 P.W.A. loan and grant allotted. W. R. Holway, 302 East 18th St., Tulsa, Okla., engr. Noted July 12. **Correction**—wrong data.

Ill., Hartford—City soon takes bids improving waterworks, incl. water softening plant and appurtenances. $29,000 grant and loan allotted by P.W.A. R. Horton, 650A East Big Bend Blvd., Webster Groves, Mo., engr. Noted Dec. 5.

Ia., Fort Dodge—City soon takes bids waterworks improvements. $74,000 allotted by P.W.A.

Ia., Harcourt—City soon takes bids waterworks improvements. $19,000 allotted by P.W.A.

Ia., Martelle—City soon takes bids waterworks improvements. $15,000 allotted by P.W.A.

Ia., Oskaloosa—City soon takes bids waterworks improvements, incl. water softening plant, chemical storage, purification tanks, pumps. $95,000 allotted by P.W.A. H. A. Brown, Ottumwa, engr. Noted Dec. 5.

Mass., Somerville—City, J. E. Mullaney, engr., City Hall, soon takes bids c.i. mains in various streets. $50,000 loan and grant. Noted Dec. 14.

Mass., Sterling—Town plans waterworks, incl. pipe lines. $50,000. P.W.A. approved loan and grant. Fay, Spofford, Thorndike, 44 School St., Boston, engrs. A. Anderson, chn. Water Bd. Noted Dec. 14.

Mass., Weymouth — Town, H. Dowd, chn. Water Comn., plans filtration plant at Great Pond. $130,000. P.W.A. loan approved. Noted Feb. 8.

Miss., Clinton—City plans waterworks improvements, incl. additional well, pump house, pumping equipment and electric storage tank. P. W.A. approved $24,000 loan and grant.

Miss., Quitman—Town has decided not to construct waterworks system. P.W.A. at Washington rescinded $30,000 allotment for same. P. O'Brien, Quitman, engr.

N. J., Glen Rock—Bd. Boro Council soon takes bids waterworks and distribution system. $138,000. $114,000 P.W.A. loan allotted. F. M. Evans, 96 Rodney St., engr. Noted Oct. 19.

N. Y., Batavia—Voted not more than $96,000 bonds for 1½ m.g. reservoir. C. W. Hartley, mayor. Noted July 19.

N. Y., Rochester—Water Com. making plans to tap Honeoye Lake to augment city water supply, either by constructing conduit along Honeoye Creek, or using pipe line. Plans to tap Lake Ontario are being pushed. M. D. Hayes, city engr.

N. D., Williston—City plans constructing permanent water supply, by tapping Missouri River 2 mi. south of here, $15,000, or constructing pumping station at Lewis and Clark Bridge with connecting pipe line. D. C. Poling, city aud.

O., New Washington—Village plans municipal waterworks system. $59,000. P.W.A. approved 70-30 loan and grant above amount for same. Noted Sept. 7.

Okla., Ardmore—City plans water filtration plant. $37,000. S. Mathews, Ardmore, engr. P.W.A. loan and grant approved.

Okla., Eldorado—City made plans new dug well and watermain extensions. $20,000.

Okla., Enid—City made plans 2 new dug wells, force main. $35,000. P.W.A. funds allotted. C. H. Rightmire, Enid, engr.

Okla., Freedom—Voted bonds new waterworks system. $20,000. V. V. Long & Co., Colcord Bldg., Oklahoma City, engrs. Noted July 5.

Okla., Jet—City voted bonds for waterworks system. $20,000. P.W.A. project. V. V. Long & Co., Colcord Bldg., Oklahoma City, engrs. Noted Dec. 28, 1933.

Okla., Lexington—City voted bonds for waterworks system. $15,000. P.W.A. project. E. H. Durkee, Lexington, engr. Noted Dec. 7.

Okla., Nowata—City bids latter part of August, waterworks improvements, $21,000, filter plant improvements, $16,000. Black & Veatch, 700 Mutual Bldg., Kansas City, Mo., engrs.

Okla., Oklahoma City—City plans raising present lake dam 4 ft. for additional storage. $20,000. T. G. Banks, city engr.

Tex., Morgan—City, c/o C. M. Bule, mayor, plans purchasing existing system and constructing new tanks, pipe lines, hydrants, etc. $16,000 P.W.A. loan approved. J. Rady, 400 Majestic Bldg., Fort Worth, engr. Noted July 26.

Tex., Overton—City Council, election Aug. 14, $110,000, water and sewerage system.

Tex., Three Rivers—City, c/o H. Coquat, mayor, revising plans waterworks improvements, incl. pumping plant units, 100,000 gal. elevated tank and tower, water treatment plant, small dam, etc. $60,000. Bonds authorized to replace P.W.A. funds. A. A. Pirie, 655 East Woodlawn St., San Antonio, engrs. Noted May 31.

Ont., Aylmer—Public Utilities Comn. plans constructing 125,000 Imperial gal. elevated steel water tank. D. H. Fleming, 125 Ranleigh Ave., Toronto, to prepare report.

Ont., Kitchener—See "Sewerage and Waste Disposal."

Ont., Toronto—City soon takes bids pumping station near Victoria Park, in connection with Toronto's $14,000,000 duplicate water system. $900,000. Gore, Nasmith & Storrie, 1130 Bay St., engrs. H. G. Acres, Niagara Falls, consult. engr.

BIDS ASKED

†D. C., Wash.—Aug. 14, by Treas. Dpt. at office Sup. Archt., Wash., D. C., cold water booster pumps for Dpt. Agriculture Extensible Building.

Mich., Port Hope—Aug. 6, by B. R. Webb, village clk., constructing water filtration and distribution system, incl. 9,500 ft. 2- to 6-in. watermains, valves, hydrants, 1,400 ft. 10 in. intake line, 6,400 g.p.hr. filtration plant, pumps and pressure tanks. Est. $25,000. W. R. Ranson, Rm. 12, Oliver Bldg., North Saginaw St., Pontiac, engr. P.W.A. allotted $25,000 loan and grant. Noted Feb. 22.

Minn., Aitkin—Aug. 7, by City, furnishing and constructing 50,000 to 56,000 gal. wooden water tank 16-18 ft. high and approximately 24 ft. diam. J. L. Spalding, secy.

Minn., Green Isle—Aug. 6, by Village, H. Groetsch, clk., one 50,000 or 40,000 gal. steel water tank, on 80 ft. tower, or one 50,000-40,000 gal. wooden tank, on 80 ft. steel tower; one 12x12 ft. pump house. E. G. Briggs, 1520 Hythe St., St. Paul, engrs. **P.W.A.**

Mo., St. Louis—Aug. 21, by Bd. P. Service, City Hall, 1,620 lin.ft. 20 in. c.i. main in Lawton Ave., and 2,550 ft. in Hall St. $12,520.

Nev., Fallon—Aug. 8, by A. E. Wilson, city clk., constructing water supply system, incl. distribution mains, 1 m.g. reservoir of semi-subsurface type, connected with supply mains 35,898 ft. 4- to 8-in. c.i. pipe, 9,900 ft. 10 in. wrapped steel pipe. L. W. Crehore, Fallon, engr. Noted July 26.

N. Y., Clayville—Aug. 8, by H. Lizars Aberdeen engr., 702 Lodi St., Syracuse, c/o S. W. Brennan, atty., Mayro Bldg., Utica. 200,000 gal. flat bottom steel storage tank; 150 meters; 24 hydrants with valves and fittings; 600 ft. 6 in. vitr. pipe; 2,000 ft. barbed wire fence; 1,400 ft. ¾ in. copper pipe, for Village. $55,000 voted.

O., Louisville—Aug. 7, by Village Council, waterworks plant, wells, elevated storage pumping station. $50,671. P.W.A. project. G. A. Reese, 360 Clark Bldg., Canton, engr. Noted Oct. 19.

Ont., Toronto—Aug. 7, by Chairman Bd. Control constructing surge tank at John St. Pumping Station, also connection to Shaft No. 5A, at same station.

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Buildings:

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Commercial 50
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Federal Government projects are classified under heading denoting type of work and designated by symbol of †

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CONTRACTS AWARDED

†Ariz., Coolidge—U. S. Indian Service, drilling 30 wells and several test wells for San Carlos Project, to Roscoe Moss Co., 4360 Worth St., Los Angeles, Calif., $91,705. Bids June 29.

Calif., San Francisco—Public Utilities Comn., City Hall, N. A. Eckart, ch. engr. and genl. mgr. San Francisco Water Dpt., constructing Sunset Reservoir supply line, involving 8,900 lin.ft. steel pipe with asphalt dip, to Barrett & Hilp, 918 Harrison St., $157,670. Bids July 6, awarded July 24.

Ia., Storm Lake—City Council, drilling new city well, to Thorpe Bros., 2340 6th St., Des Moines. Noted July 10.

Ky., Morganfield—City, water reservoir improvements, incl. new cover and general repairs, to Cole & Moore, Paducah. Project to be financed with local funds. Black & Veatch, 405 East 13th St., Kansas City, Mo., engrs. Noted July 19.

Mich., Ionia—M. Underwood, city clk., waterworks improvements and extensions, incl. one 400 gal. and one 250 gal. high pressure pumps with motors and control equipment, to Allis-Chalmers Mfg. Co., 1126 South 70th St., Milwaukee, Wis., $1,413***furnishing 1,000 bbl. portland cement, to W. C. Page, Ionia, at $2.31 per bbl. in paper***reinforcing steel, to Grand Rapids Steel & Supply Co., Grand Rapids, $1,617. Bids June 5.

Minn., St. Paul—University of Minnesota, R. S. Callaway, purch. agent, Minneapolis, water mains and service connections at University Farm, to Woodrich Constr. Co., 404 Natl. Bldg., Minneapolis, $12,995. Bids July 16.

Miss., Meadville—Town, drilling and completely equipping well with all machinery and make well which will test adequate capacity for use of town, to Layne Central Co., Chelsea Ave., Memphis, Tenn. Bids July 21 and awarded July 21.

Mo., Clarence—City, waterworks system, incl. earthen dam with core wall to create 45 m.g. storage reservoir, filter plant and equipment, tank on tower, c.i. distribution mains, fire hydrants, etc., to H. Tidd, Brookfield. P.W.A. allotted $95,000. **P.W.A.** J. W. Skikles & Co., 3212 Olive St., Kansas City, engrs.

N. C., Thomasville—Town, Mayor and Council, constructing elevated tank and tower to Chicago Bridge & Iron Wks., 1500 North 50th St., Birmingham, Ala., $58,400***tank foundations, to L. S. Bradshaw, Salisbury, $6,785***piping, valves, etc., to Fiske-Carter Constr. Co., Spartanburg, S. C., $7,540***water level indicator, to Thompson Electrical Co., 20 West Hargett St., Raleigh, $1,515. Grand total $74,240. Bids May 25. Noted May 17.

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†Federal Government.

For official proposal advertising see Searchlight Section

Waterworks (Continued)

Okla., Ponca City—City, constructing earthern dam for water supply, to **M. E. Gillioz**, Monett, $119,340, est. $114,000***gravity flow pipe line to Smith Bros. Co., Walsix Bldg., Kansas City, Mo., $206,410, est. $250,000; 10 m.g.d. filtration plant, to Hill & Evans, Fort Smith, Ark., $261,380, est. $280,000; pumping equipment for water purification plant, to Worthington Pump Co., 424 Boulder St., Tulsa, $17,470. Grand total $604,600. W. R. Holway, Tulsa, city engr. Bids July 23. Noted July 5.

Pa., Tarentum—Borough, municipal water plant, to Pitt Constr. Co., Gulf Bldg., Pittsburgh, $109,134. Bids June 1. Noted May 24.

S. D., Madison—City, elevated steel tower, to Pittsburgh Des Moines Steel Co., 1015 Tuttle St., Des Moines, Ia., $21,574 (400,000 gal. tank and dismantling old standpipe) foundations for tower, to J. Robertson & Co., Madison, $2,450***installing piping and removing old pipes, to C. L. Breedlove, Madison, $1,104. Grand total $25,128. Bids July 2.

†Va., Langley Field—Con. Q.M., water purification system for gymnasium-swimming pool, to Bowers Bros., 2015 Sansom St., Phila., Pa., $4,169. Bids June 28.

Vt., Stowe—Village, H. C. McMahon, clk., furnishing, placing 24,000 ft. c.i. pipe and fittings, 12 gate valves and boxes, to W. G. Fritz Co., West Orange, N. J. **P.W.A.** Bids July 12, awarded July 18.

†Washington—Dpt. Interior, Bureau Reclamation, c/o Columbia Basin Comn., Civic Bldg., constructing water supply and sewerage systems at camp of Grand Coulee Dam, to Arcorace & Co., Seattle, $56,804. Bids July 2. Noted June 21.

SEWERAGE AND WASTE DISPOSAL

PROPOSED WORK

Ariz., Phoenix—City making plans 15 mi. 8- to 54-in. concrete storm sewers, $270,000, and 51 mi. 8- to 21-in. sanitary sewers, $350,000. W. C. Lefebvre, city engr. Noted June 28.

Ark., Fort Smith—City probably will not take bids until October, constructing J St. Intercepting Sewer Project to discharge flow of North J St. sewer into river at point large trunk sewer is now discharged, 3,000 ft. north of mouth to North J St. sewer, involving 3,020 ft. 27 in. vitr. clay pipe. W. L. Winters, Merchants Natl. Bank Bldg., engr. P.W.A. allotted $35,000.

Calif., Escalon—Escalon Sanitary Dist., G. A. Wallace, chn., plans sewer line. $18,000 for labor and $12,000 for materials.

Calif., Petaluma—City election Aug. 28, $325,000 bonds to secure P.W.A. loan and grant for sewerage system.

Fla., Pensacola—City plans storage tank and sewage treatment plant. P.W.A. allotted $240,000 for immediate use. City Engineer, engr.

Idaho, Boise—City plans improving and extending sanitary sewers. $135,000. P.W.A. loan granted.

Ind., Richmond—City voted to construct sewage disposal plant. $500,000. Applied for $140,000 P.W.A. loan and bonds will be sold for $360,000. **Maturity in fall.**

Ia., Clarion—City soon takes bids sewage disposal plant. $30,000 allotted by P.W.A.

Ia., Corning—City soon takes bids sewage disposal plant. $42,000 allotted by P.W.A.

Ia., Decorah—City soon takes bids sewage disposal plant. $53,000 allotted by P.W.A. Noted July 27.

Ia., Forest City—City soon takes bids sewage disposal plant. $40,000 allotted by P.W.A.

Ia., Oskaloosa — City Council plans constructing sewage disposal plant, survey underway to determine cost of same; and extending sewer in H St. and widening Avenue A. $20,100. P.W.A. funds allotted.

Ia., Sac City—City delayed taking bids for sewage disposal plant, auxiliary piping and sewer connections. $58,000 allotted by P. W. A. Currie Eng. Co., Webster City, engrs. Noted July 25.

La., Minden—City plans sanitary sewerage system and sewage pumping station. P.W.A. approved $66,000 loan and grant. W. T. Drew, Minden, engr. Noted Oct. 26.

Mass., Leominster—City plans sewerage system, incl. disposal plant and sanitary sewer mains. P.W.A. Docket 5039. $250,000. Federal grant and loan approved. Metcalf & Eddy, 600 Statler Bldg., Boton, engrs. Noted Jan. 18.

Mass., Walpole—Town bids in fall sanitary sewerage system. $125,000 Federal Govt. approved loan and grant. Fay, Spofford & Thorndike, 44 School St., Boston, engrs. Noted Jan. 4.

Minn., St. Paul—City bids late in Aug., constructing interceptor sewer CD-3rd Part, 6,000-7,000 lin.ft. tunnel in sandstone, 30x72 in. section in West 7th St. area, est. $80,000. G. M. Shepard, city engr. **P.W.A.**

Constr. News page 42

Mo., Springfield—City soon takes bids extending drainage system, Bond Issue Sewer Item 20. $90,000. P.W.A. project. Russell & Axon, 4903 Delmar Blvd., St. Louis, engrs.

Mo., Webster Groves—City soon takes bids sanitary sewers in various streets Sewers Dist. 13, $12,152 and in Sewer Dist. 14, $169,083. $2,600 grant allotted by P.W.A. for former and $37,500 for latter district. J. B. Clayton, City engr.

N. Y., Brocton—Village plans constructing sewerage system and disposal plant. $134,000. E. G. O'Connor, in charge. Engineer not appointed.

N. Y., Riverhead—Town making preliminary plans sanitary sewers and sewage disposal plant. $400,000. T.E.R.A. project. **Maturity soon.** F. J. Biele, 184 Nassau Ave., Huntington, consult. sanitary engr.

N. C., Raleigh—City plans 2 sewage treatment plants, one on Walnut Creek and other on Crabtree Creek. $500,000. P.W.A. loan approved. J. Whitman, city engr. Noted Mar. 1.

O., Bowling Green—City, W. W. Rust, dir. P. Service, completing plans and soon takes bids sewage treatment plant, storm relief and intercepting sewer, concrete tanks and brick superstructure. $250,000. P.W.A. project. Smith & Niles, Nicholas Bldg., Toledo, engrs. Local bond issue passed. Noted May 10.

O., Cleveland—Bd. Comrs. Cuyahoga Co., preparing estimates concrete storm sewer in York Rd. from Wooster Pike to Parma Heights Village. Est. about $25,000. J. O. McWilliams, Court House, co. engr.

Pa., Pittsburgh—City, L. Johnston, supt. P. Wks., plans incinerator, Aspinwall, near here. $300,000. C. M. Reppert, City-County Bldg., engr.

Tex., Overton—See "Waterworks."

Wash., Seattle—Bd. P. Wks. plans (1st unit) Henderson St. sewer $200,000, total $850,000; also widening Empire Way pavement from Rainier to Renton Aves. $400,000.

Ont., Kitchener—City Council, S. Shupe, city engr., City Hall, is preparing report on relief program to be started later in season and includes storm sewer. $150,000, and watermains and sewer extensions. $50,000.

Ont., St. Thomas—Council plans to submit by-law to rate payers in December for construction incinerator for disposal of garbage. $35,000. W. C. Miller, city engr. Noted Nov. 18.

Ont., Toronto—Reeve J. Doggett, plans by Municipal engineer, incinerator, East York.

BIDS ASKED

Calif., San Luis Obispo—Aug. 16, by C. M. John, city clk., furnishing mechanical equipment for sewage treatment plant, (1) mechanically cleaned bar screen; (2) coagulant mixing equipment; (3) driving mechanism for existing sludge removal equipment; (4) sedimentation basin sludge removal mechanism and appurtenances.

Ill., Clinton—Aug. 22, by Bd. Trustees Sanitary Dist., C. M. Warner, pres., furnishing, installing 19,000 ft. 8- to 27-in. sewers; sewage pumping station; sewage treatment plant, incl. screen and grit chamber, settling tanks, trickling filter, administration building and appurtenances. P.W.A. project. Greeley & Hansen, 6 North Michigan Ave., Chicago, Ill., hydraulic and sanitary engrs. Noted Mar. 8.

Ia., Cedar Rapids—Aug. 24, by City, at office L. J. Storey, clk., constructing 4 concrete digester tanks, pipe tunnel, power plant building, sludge storage well, automatic pumping station and pressure line across Cedar River. Sect. F: 200 hp. gas engine generator set. Sect. G: vacuum filter set. Sect. H: 2 floating or semi-floating sludge digester covers and 1 gas holder to be installed in three of the four 60 ft. tanks. Sect. I. H. R. Green Co., Bever Bldg., consult. engrs.

Md., Ferndale—Aug. 8, by City, J. H. Ellis, Glen Burnie, 23,000 lin.ft. 8- to 12-in. terra cotta sewer, 6 in. house connections and M. H. and sedimentation tank. Est. $33,000. W. C. Monroe, c/o Owners, engr. P.W.A. project.

Mich., Battle Creek—Aug. 20, by City, constructing 11,000 ft. 54 in. rein.-con. pipe intercepting sewer, 1 river crossing, 1 inverted siphon, manholes and appurtenances. P.W.A. project. M. A. Chambers, city engr. H. P. Jones Co., 2nd Natl. Bank Bldg., Toledo, O., consult. engrs. Noted Oct. 26.

Mich., Bessemer—Aug. 7, by City Clerk, sewage treatment plant and appurtenances. $90,965. P.W.A. allotted $91,000 loan and grant. Suhr, Berryman, Peterson & Suhr, 130 North Wells St., Chicago, Ill., engrs. Noted Dec. 21.

Minn., St. Paul—Aug. 7, by H. W. Austin, city purchasing agent, constructing interceptor sewer CD 2nd Part, inc. 8,800 ft. concrete tunnel in sandstone, 30x72 in., est. $100,000. **P.W.A.** G. N. Shepard, city engr.

Mo., St. Louis—See "Contracts Awarded."

O., Columbus—Aug. 7, by W. J. Lucks, dir. Serv., 50x90 ft., garbage incinerator, 57 ft. high, brick, rein.-con., steel. $117,000. P.W.A. project. P. W. Matzel, City Hall, engr.

O., Glendale—Aug. 8 (extended date) Village Clerk, extending and improving treatment plant, $21,000; also 22,370 ft. pipe and appurtenances, Willow Ave., Est. $50,000. P.W.A. project. J. A. Eng. Co., Traction Bldg., Cincinnati,

Okla., Henryette—See "Contracts Awa

Wis., Madison—Aug. 23, by Metro Sewerage Dist., constructing additions to Springs Sewage Treatment plant. Greeley & Hansen, 6 North Michigan Chicago, Ill., engrs. H. O. Lord, ch Noted June 28.

Ont., Ottawa—See "Contracts Awarded

CONTRACTS AWARDED

Calif., San Francisco—S. J. Hester, Dpt. P. Wks., 7 ft. circular rein.-con. involving 1,308 lin.ft. pipe, manholes, Yosemite Ave. from Keith to Ingalls St. MacDonald & Kahn, Financial Center $49,415. Est. $61,000. Bids July 11, aw July 20.

Ill., Chicago—Sanitary Dist., 16 tes 4 ft. in diam. to rock or depth specifi Lake States Eng. Co., 111 West Jackson $8.50 per lin.ft. Bids July 12. Awarded 26.

Mass., Methuen—Town, W. H. Craven, Sewer Comn., Town Hall, constructing pump station and sewer mains, to L. C. Cyr, 45 rose St., Lawrence, $83,655. Bids June awarded July 20. Noted June 14.

Mass., Taunton—City, F. S. Smith, Sewer Comrs., City Hall, constructing Mill Sewerage System, using c.i. pipe, to Constr. Co., 88 Tremont St., Boston. Bids June 1, awarded July 19. Noted M

Mich., Dearborn—M. A. Stevens, city constructing additions to sewage disposal Contrs. 68 and 69 and Contr. 71, to Bros., Dearborn, $56,268 and $17,307 tively***contract for sludge incinerator Nichols Engineering Co., 40 Wall St., York, $56,000. Grand total $130,575. project. Noted June 7.

Minn., Lake City — City, sewage disposal plant, to M. J. O'Neil, 609 New York St. Paul, $36,820***lift station, to Olson, Lake City, $3,930***outfall sewer watermain, to J. C. Schneider, Independe $9,500. Grand total $50,250. **P.W.A.** July 16.

Mo., Clarence—City, sewage disposal auxiliary piping, sewerage system, to Ri & Sons, Quincy, Ill. $48,000 grant and loan lotted by P.W.A. J. W. Shikles & Co., Olive St., Kansas City, engr. **P.W.A.**

Mo., St. Louis—City, reconstructing and pairing 3.5 mi. Old Mill Creek Sewer Vandeventer Ave. to Mississippi River, forces, under direction of Assistant Sewer missioner Porath. $146,000. **P.W.A.** $35 grant allotted by P.W.A. L. A. Pettus engr.

N. Y., Long Island City—Queens Boro Subway Bldg., to E. W. Fitzpatrick, in 33rd Ave. $585***to Glenmore Contg. 757 Glenmore Ave., Brooklyn, 63d Ave., 110th Rd. $1,373; 193rd St. $1,129; Matheson Court $994***to Julia Gallo, 169-14 Ave., Flushing, Metropolitan Ave. $1,286*** Yellowstone Constr. Co., 6854 Orville St. est Hills, 58th Ave. $388***to A. Maio, 116th Ave., Ozone Park, 101st Ave. $1,369*** to Pan Constr. Co., 244 Jackson Ave. Blvd. $60,388***to C. Sovierio, 157 Ashford Brooklyn, Pershing Crescent $2,656***to H. Mullin Contg. Co., 139-39 Jamaica Ave., Jam Penelope St. $4,403. Bids June 27. total $76,582. Noted June 21.

N. Y., Long Island City—President Boro, Queens Subway Bldg., to Matarazzo & Yondola, 1163 61st St., Brooklyn, sewers in mars Blvd. $2,886***to Palmo Constr. 105-12 101st Ave., Ozone Park, 59th Dr. 99th Ave., $5,726***to Marmoth Constr. 94-14 108th Ave., Jamaica, 79th St., 125th Ave., $1,720***to Gramaglia Constr. 5037 Fieldston Rd., New York, 32nd $1,033; 109th Rd., $1,122; 168th St., $4 Hempstead Ave., $4,528***to Victor Clemente 115-28 131st St., South Ozone Park, Pl., $860; 198th St., $700; Ferndale $1,270; 84th St., $621***to Flushing Co., 66 Wyoming Ave., Forest Hills, 158th $25,444***to Belfatto & Vassalo, 147-42 Ave., Jamaica, Inwood St., $1,551***to Capasso, 4121 Gunther Ave., Waltham St., 186. Grand total $62,668. Bids July 11. July 5.

O., Columbus—W. J. Lucks, dir. Serv., 11, Beulah Rd. Sanitary and Storm Sewer W. S. Rae, Koppers Bldg., Pittsburgh, $72,740. **P.W.A.** Bids July 10. Noted June

O., Columbus—W. J. Lucks, dir. Serv., 2, sewage disposal plant, sludge filter involving 700 cu.yd. excav., vacuum filter auxiliary sludge, elevator, chemical filter, conveyors, mechanical weighing device, chloride storage tanks, sludge mixing and tling tanks, to Bryant & Detwiler Co., 2304 Penobscot Bldg., Detroit, Mich., $99,092. P.W.A. Bids July 12.

†Federal Government.

Sewers, etc. (Continued)

Okla., Henryetta—City, 1,650 ft. 36 in. concrete storm sewer in Trudgeon and 17th Sts., by hand labor. $26,000.

R. I., Bristol—Simpson Bros. Corp., general contractors, 193 Hanover St., Boston, Mass., excavation in connection with sewage disposal pumping station, Oliver and Thames Sts., to Ricci & Ricci Exc. Co., 207 Roosevelt St., Providence***heating, to Pierce & Cox, 143 Kingston St., Boston, Mass.***plumbing, to Waldron & Co., Bristol***electrical work, to Talbot & Hopkins, Bristol, for Town. W. T. Dwyer, secy., Sewer Comn., Town Hall. Noted June 21, under "Contracts Awarded."

R. I., Pawtucket—City, constructing storm drains in Fairview Ave., to I. Capaldi, 270 Mt. Pleasant St., Providence, $38,672. Est. $40,000. T. E Harding, City Hall, engr.

S. C., Columbia—City Council, furnishing labor, materials, equipment, etc., for constructing certain complete extensions to sanitary sewerage system, involving 102 manholes, 44,741 ft. 18- to 36-in. concrete or terra cotta pipe, 102 manholes, to Blythe Bros., Brevard Court, Charlotte, N. C., $206,325. P.W.A. Bids July 6, awarded July 21. Noted June 28.

Tex., Dallas—City, c/o O. H. Koch, dir. P. Wks., storm sewers, Hydraulic Fill Area Dist. 10, to Construction Service, Inc., Tramway Bldg., Denver, Colo., $159,294. Est. $160,000. P.W.A. project. Bids July 18.

Tex., San Antonio—Bexar Co. Water Control & Impvt. Dist. No. 3, Los Angeles Heights, 5 mi. 18- to 24-in. concrete sanitary sewer mains, Los Angeles Heights, to Walsh & Burney, 928 North Flores St., $116,399. P.W.A. project.

Tex., San Antonio—Furnishing pipe and laying sanitary sewer mains, also some 18 in. rein.-con. storm pipe, total length about 5 mi., throughout residential district, to Walsh & Burney, 928 North Flores St., $113,166. Awarded July 14. J. K. Beretta, Inc., Natl. Bank Commerce Bldg., engrs.

Tex., San Antonio—Bexar Co. Water Control & Impvt. Dist. 1, c/o J. C. Hall, South Texas Bank Bldg., 4 mi. 24 in. collection system in Olmos Estates to connect to city of San Antonio sewerage system, to J. H. Lee & Co. and Gilbert Falbo Co., 523 North Flores St., $93,547. Est. $115,000. Noted June 21.

Va., Sandston—Bd. Supervs. Henrico Co., outfall sewer and disposal plant, to M. B. Van Doren, Richmond, $28,921***2,000 gal. tank on 100 ft. steel tower, to Chicago Bridge & Iron Wks., 37 West Van Buren St., Chicago, Ill., $12,200***2 deep well turbine pumps, to Sydnor Pump & Well Co., 1310 East Main St., Richmond, $3,384. Grand total $44,505. Bids July 17. Noted July 12.

Ont., Cardinal—Town, constructing lateral sewers, to Mahoney Bros., Morrisburg, $25,000. James, Proctor & Redfern, 36 Toronto St., Toronto, engrs.

Ont., Ottawa—City, new rein.-con. storm sewers in Lyon, O'Connor and Nepeau Sts., day labor. Est. $28,750. F. C. Askwith, City Hall, engr. Noted June 7.

BRIDGES AND GRADE CROSSINGS

PROPOSED WORK

Ill., East St. Louis—City plans constructing 2 mi. rein-con., steel bridge with 5 vehicular lanes and side walks, across Mississippi River between Missouri Ave., East St. Louis and Franklin Ave., St. Louis, Mo. Applied for $3,400,000 grant and loan under P.W.A. U. S. War Dpt., Wash., D. C., has given final approval to plans. G. A. Maney, c/o Northwestern University, Evanston, prepared plans. Noted Apr. 19.

N. Y., Utica—New York Central R.R. Co., J. F. Pfau, ch. engr., 466 Lexington Ave., New York, plans Barnes Avenue Crossing. $350,000. Maturity in October.

O., Cleveland—Bd. Comrs. Cuyahoga Co., G. H. Stahler, clk., plans repairing concrete, steel and wood block Harvard-Denison Bridge, $75,000. J. O. McWilliams, Court House, engr.

O., Defiance — O. W. Merrell, dir. Hys., Columbus, ordered preliminary survey for construction of bridge over Auglaize River.

Oklahoma—State Hy. Dpt., Oklahoma City, making plans constructing 2 span 90 ft., rein.-con. bridge over Deep Fork Creek, at Edmond, $30,000; 110 ft. steel truss bridge on concrete piers, 39th St., $40,000, both Oklahoma Co.; 50 span 4,700 ft. steel truss bridge on concrete piers over South Canadian River, Purcell, McLain. Co., $500,000. C. L. Wilson, state hy. engr.

Oklahoma—State Hy. Dpt., Oklahoma City, plans overpass over Rock Island Yards, near El Reno. $260,00. C. L. Wilson, state hy. engr.

Okla., Oklahoma City—Oklahoma Co. plans 4 span 110 ft. rein.-con. bridge at Choctaw. $40,000. F. Frazier, Court House, co. engr.

Texas—State Hy. Comn., J. Wood, chn., Austin, making plans Richland Creek bridge, having 7 beam stringer spans, Hy. 31, between Corsicana and Dawson, Navarro Co. $22,710. C. Rice, Records Bldg., Dallas, engr.

Tex., Conroe—Montgomery Co., c/o R. H. Weatherly, judge, plans bridges and roadwork, $492,000 P.W.A. allotment approved. W. F. Smith, Conroe, engr.

Tex., Dallas—State Hy. Dpt., Austin, Gilchrist, state hy. engr., soon takes bids constructing underpass, connecting Elm, Main and Commerce Sts. under railroad tracks, for City. $700,000. Plans and specifications are available for preliminary review in office of Clifton Rice, div. engr. State Hy. Dpt., Records Bldg. Noted Apr. 5.

Tex., Port Isabel—Padre Island Causeway Co., c/o J. W. Pate, McAllen, soon takes bids causeway across Laguna Madre, from Pt. Isabel to Padre Island, 1,600 ft. long. Est. $400,000.

†Wyoming—P. Rds., Denver, Colo., recalled bids to have been opened July 26, 3 bridges in Yellowstone Park. Will readvertise. Noted July 19.

Ont., Middlemiss—Elgin Co. Council, A. Bell, engr., Court House, St. Thomas, plans rip rap and other embankment protection for McIntosh Bridge. $35,000.

BIDS ASKED

California—Aug. 15 by State Hy. Comn., Sacramento, constructing culvert over Melga Ditch, consisting of two 8 ft. rein.-con. spans with wing walls; constructing bridge over Lakeside Canal, consisting of two 31 ft. rein.-con. spans, widening existing bridge over Cross Creek, consisting of six 30 ft. 6 in. spans, by constructing 8 ft. 9 in. rein.-con. widening strips at each side and wing walls, existing structures at Melga Ditch and Lakeside Canal and interfering portions of existing bridge over Cross Creek are to be removed, all in Kings Co. C. H. Purcell, P. Wks. Bldg., Sacramento, engr.

California—Aug. 16, by State Hy. Comn., Los Angeles, constructing bridge over Escondido Creek, 12 mi. south of Carlsbad, consisting of four 45 ft. rein.-con. slab spans on rein.-con. piles and abutments with wing walls, San Diego Co. C. H. Purcell, P. Wks. Bldg., Sacramento, engr.

Ill., Princeton—Aug. 10, by Dpt. P. Wks. & Buildings, Div. Hys., 36 ft. steel I-beam bridge in Bureau Co. G. H. Baker, engr. of roads and city streets.

Indiana—Aug. 7, by State Hy. Comn., Indianapolis, bridge extension over Hart Ditch, Contr. 955, No. A1726, at Lake Co.; bridges over Goose Creek and over Big Pine Creek, Contr. 956, No. 18-B 1515 and 1516, Benton Co.; over Nettle Creek and over Nettle Creek Overflow, Contr. 957, No. 38-K 670 and 671, Wayne Co.; bridge at West Fork of White River, Contr. 958, No. 44-J-86-A, Fayette Co.; bridges over Lock Fork Branch, Contr. 959, No. 164-A-1633, Dubois Co.; over east fork Lake Branch, No. 164-B-1654, Crawford Co. J. D. Adams, chn.

Md., Baltimore—Aug. 10, by State and City, Federal Reserve Bank Bldg., Contr. BC-143-78-P.W.A. Federal Aid Project N.R.M. 40-E. Orleans St. viaduct, 2,075 ft. long, etc., located in line of Orleans St. extended, beginning at Gay St. and terminating at east curb line of upper level of St. Paul Pl. $1,200,000. P.W.A. project.

New Hampshire—Aug. 9, by State Hy. Dpt., Concord, 3 span, 146 ft. Long T-beam bridge over Soucook River, Loudon, Merrimack Co. Est. $30,000. J. W. Childs, Concord, engr.

N. Y., Elmira—Aug. 14, by Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad Street Sta., Phila., Pa., 3 undergrade bridges, track elevation. $250,000. Noted June 21.

N. Y., Hornell—See "Contracts Awarded."

North Carolina—Aug. 7, by State Hy. and P. Wks., Raleigh, Project 1621, structures from Nashville to intersection Route 95, 9.81 mi. hy. Nash Co., est. $18,000; underpass in Monroe Route 20, Project 6921, Union Co., est. $49,000. J. D. Waldrop, Raleigh, engr. Noted June 7.

Oklahoma—Aug. 7, by Dpt. State Hy., Capitol, 47 small rein.-con. culverts on Hy. 18, Pawnee, Pawnee Co. $31,460***80 ft. rein.-con. bridge, Optima, Texas Co. C. L. Wilson, state engr.

Que., Howick — Aug. 6, by T. T. Gebbie, secy.-treas. Municipality, rein.-con. bridges over English River and approaches.

CONTRACTS AWARDED

California—C. H. Purcell, state hy. engr., Los Angeles, constructing bridge over San Gabriel River, and bridge over Coyote Creek, Los Angeles Co., to B. O. Larsen, 1340 E St., San Diego, $70,965. Bids July 12, awarded July 19.

†Idaho—Pub. Rds., Dpt. Agriculture, Ogden, Utah, improving Dustin Bridge in Idaho Natl. Forest, Valley Co., to Knowlton & Rupert, Layton, Utah, $31,120. Bids June 29.

Illinois—Dpt. P. Wks. & Buildings, Div. Hys., Springfield, steel beam bridge on concrete piles east of Paris, Edgar Co., to Zimmerly Bridge Co., Paris, $24,996. Bids May 22, awarded July 21. Noted May 10.

Indiana—State Hy. Comn., Indianapolis, bridge in Marion Co., to E. F. Smith, 2050 South Harding St., Indianapolis, $87,881. Est. $90,753. Bids July 10. Noted June 28.

Ia., Washington—Washington Co., 19 box and circular culverts, to Risk Constr. Co., Washington, $15,150; grading 10,649 mi. road, incl. 124,950 cu.yd. excav., to G. H. Lowe, Cedar Rapids, $21,848.

Massachusetts—Essex County Comrs., R. R. Evans, engr., rebuilding wooden fender pier at Kernwood Bridge over Danvers River between Salem and Beverly, to Pitman & Brown Co., 11 Washington St., Salem, $22,807. Bids July 24, awarded July 24. Noted July 19.

Mich., Detroit—Dpt. P. Wks., City Hall, J. S. Stringham, engr., constructing city's portion of steel deck at East Grand Blvd. over Grand Trunk R.R. tracks, incl. 125,000 lb. structural steel (I-beam stringers), 17,370 ft. I-beam lock flooring, 2,500 ft. electrical field welding, 2,400 lb. reinforcing steel, to Taylor & Gaskin Co., 14840 Terry Ave., $19,000.

Minn., Jordan—Scott Co., T. H. Walsh, aud., and Carver Co., W. Schimelpfenig, aud., steel bridge with concrete supports and creosoted piling, to P. Steenberg Constr. Co., West 1757, 1st Natl. Bank Bldg., St. Paul, $43,807. Bids July 18. Noted June 28.

New Jersey—State Hy. Comn., Trenton, constructing Big Timber Bridge and approaches in Gloucester and Camden Counties, to F. A. Canuso, 804 South 12th St., Phila., Pa., $159,824. Bids July 23. Noted July 12.

N. J., Pleasantville—State Hy. Dpt., Trenton, bridge in Atlantic Co., to Versaggy Bros., Wildwood, $27,824. Bids July 16. Noted July 5.

N. Y., Hornell—City, L. F. Wheatley, mayor, steel, concrete bridge over Canisteo River in East Main St., day labor, under supervision T. H. Robinson, city engr. TERA project $40,000. **Maturity in August.**

Pennsylvania—At office S. S. Lewis, secy., Hys., Harrisburg, furnishing, delivering fabricated structural steel for rigid frame steel girder bridge, City Ave., Sect. 4, Phila. and Marion Twp., Philadelphia and Montgomery Counties, to Phoenix Bridge Co., Phoenixville, $18,864. Bids July 3. Noted June 21, under "Streets and Roads."

Texas—G. Gilchrist, state hy. engr., Austin, 2 rein.-con. bridges Hy. 3, N.R.M. 213-C, Val Verde Co., to L. A. Turner, Fort Worth, $36,817, est. $40,000. P.W.A. project. Bids July 16.

Texas—G. Gilchrist, state hy. engr., Austin, constructing 3 steel rein.-con. bridges, Hy. 89, S.P. 175-D, Palo Pinto Co., to Crouch & Noland, Strawn, $32,477 est. $40,000***constructing San Antonio River Bridge, Six Mile Creek Bridge, Hy. 66, S.P. 461-C, Bexar Co., to McKenzie Constr. Co., Smith-Young Tower, San Antonio, $102,614 est. $120,000***4 rein.-con. bridges, Hy. 27, S.P. 202-B, Kerr Co., to H. Page, Norwood Bldg., Austin, $38,101 est. $40,000. Grand total $173,192. Bids July 16.

Ont., Kitchener—Waterloo Co., concrete work for 160 ft. steel, rein.-con. bridge between Wellesley Twp. and Perth Co., to Algoma Constr. Co., c/o Dr. Burns, 693 Broadview Ave., Toronto, $23,439; steel work, to Hamilton Bridge Co. Ltd., Hamilton, $11,574.

Ont., Kitchener—Waterloo Co. Council, Courthouse Bldg., S. Cassel, clk., constructing new bridge Rd. 34 B, to Algoma Constr. Co., 693 Broadview Ave., Toronto, $37,000; and steel, to Hamilton Bridge Co., Bay St., Hamilton.

STREETS AND ROADS

BIDS ASKED

Colorado—State Hy. Dpt., State Office Building, Denver, recalled bids to have been opened July 23, for concrete paving 0.199 mi. hy. in city of Walsenburg, U.S.P.W.N.R.M. 2-13, Huerfano Co. Project will be readvertised. C. D. Vail, State Office Bldg., Denver, engr.

†Colorado—Pub. Rds., Denver, Colo., recalled bids to have been opened July 25, fine aggregate plant mix surfacing 12.363 mi. and seal coating 9.785 mi. roads in Clear Creek and Grand Counties. Will readvertise. Noted July 19.

Delaware—Aug. 22, by State Hy. Dpt., Dover, clearing, grubbing, grading, traffic bound slag surfacing 4.891 mi. Hastings Corner-Moores Corner Rd., Contr. 157, N.R.S.118, Kent Co., involving 22,000 cu.yd. earth, 1,000 cu.yd. bridge and 14,000 cu.yd. borrow excav.; Edgemoor Underpass and roadways, Contr. 367, N.R.S. 117-C, New Castle Co., 3,400 cu.yd. earth and 3,500 cu.yd. bridge excav., both foregoing under provisions of N.R.A.; clearing, grubbing, bituminous surfacing 3,900 ft. Birds Corner Rd., Contr. CN 34, 1,100 cu.yd. earth excav.; 0.64 mi. Faulk Rd.-Grubbs Rd.-Naamans Rd., Contr. CN 35, 1,300 cu.yd. earth and 10 cu.yd. rock excav.; 0.58 mi. Faulk Rd.-Naamans Rd.-Pennsylvania state line, Contr. CN 36, 1,000 cu.yd. earth and 10 cu.yd. rock excav.; clearing right-of-way, 1 in. bitulithic concrete on waterbound broken stone paving 2.1 mi. Thoroughfare Neck Rd., Contr. CN 37; 2.85 mi. Oak Hill, CN 38; 0.95 mi. Chestnut Hill Rd., Contr. CN 39, 1,500 cu.yd. earth and 250 cu.yd. rock excav.; 3,700 ft. West End Ave.-Holloway Terrace, Contr. CN 40, 1,160 cu.yd. earth excav., all foregoing in New Castle Co.

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†*Federal Government.*

Streets & Roads (Continued)

Ill., Carlinville—Aug. 7, by Dpt. P. Wks. & Buildings, Div. Hys., concrete paving 2.1872 mi. road in Benld, and rein.-con., box culvert extension; both Macoupin Co. G. H. Baker, engr. co. roads and city streets.

Ia., Des Moines—Aug. 6, by Executive Council, R. W. Ewing, secy., State House, sheet or rock asphalt surfacing existing roadways on Capitol Grounds.

Ia., Iowa City—City soon takes bids grading, curbing, guttering, brick paving various streets. $45,000. $30,000 P.W.A. allotted. J. F. Sprvatt, city engr.

Ia., Spencer—Aug. 9, by Comrs. Clay Co., graveling 24,000 cu.yd. secondary road.

Kentucky—State Hy. Comn., Frankfort, cancelled bids to have been opened on July 26 for grading, draining 1.481 mi. Elizabethtown-Leitchfield Rd., N.R.H. 147 DG, Hardin Co.; curbing, guttering, medium type surfacing 0.974 mi. street in Beaver Dam, N.R.M. 125 EC-S, Ohio Co.; beautification type of construction, incl. constructing walls, grading, surfacing Bedford-Milton Rd., N.R.H. 145 BG, Trimble Co.; bridge and surfaced approaches over Licking River between Covington and Newport, N.R.M. 320 BB, Kenton-Campbell Counties. Noted July 19.

Md., Baltimore—Aug. 8, by Bd. Awards, vitr. brick on concrete paving with cement filler, 8,700 sq.yd. various streets Contr. 646, Bureau of Hys., Municipal Bldg., engrs.

Missouri—Aug. 10, by State Hy. Dpt., Jefferson City, improving roads and bridges in Buchanan, Holt, Nodaway, Monroe, Scotland, Jefferson, St. Charles, St. Clair, Ozark, Shannon, Dunklin, Jefferson, Atchison, Linn, Sullivan, Morgan, Dade, Christian, Stone, Taney, Howell, Shannon, Franklin. T. H. Cutler, ch. engr.

New Hampshire—Aug. 9, by State Hy. Dpt., Concord, 3 in. bituminous macadam on 4 in. broken stone base course on 6 in. gravel base course paving 2.37 mi. Whittier Rd., Meredith, Belknap Co., est. $80,000; 3 in. bituminous macadam surface course on 5 in. broken stone base course on 6 in. gravel sub-base course paving 2.348 mi. Dartmouth College Rd., Winchester, Cheshire Co., est. $80,000. C. P. Riford, Concord, engr.

N. J., Essex Fells—Aug. 13, by Mayor, improving Roseland Ave. and Hathaway Lane. $25,000. A. H. Somerville, 378 Bloomfield Ave., Caldwell, engr.

N. Y., New York—S. Levy, pres. Manhattan Boro, Municipal Bldg., rejected bids June 6, laying, relaying sidewalks and curbs when and where directed during 1934. Noted May 31.

N. Y., Wingdale—Aug. 8, at office Dpt. Mental Hygiene, State Office Bldg., Albany, constructing roads and walks, at Harlem Valley Hospital. F. W. Parsons, comr.

North Carolina—Aug. 7, by State Hy. and P.W. Comn., Raleigh, grading, crushed stone, structures 4.7 mi. Project 6540, Mecklenburg Co., est. $25,138; grading, crushed stone, structures 7.58 mi. Project 6696, Rowan Co., est. $51,889; grading, structures, underpass and approaches 0.35 mi. Project 6221, Catawba Co., est. $34,373; bituminous surface treating 4.52 mi. Project 6260, from Hickory to Moore's Ferry Bridge, Catawba Co., est. $16,650; bituminous surface treating 4.37 mi. intersection of Route 12 to Pitt Co. line, Project 1304, Edgecombe Co., est. $16,210; concrete widening 0.5 mi. Project 6697, Rowan Co., est. $5,842; concrete paving 0.1 mi. Project 9402, Haywood Co., est. $3,867; bitumionus surfacing 9.81 mi. Project 1621, Nash Co., est. $44,576. J. D. Waldrop, Raleigh, engr.

Oklahoma—Aug. 7, by State Hy. Dpt., Capitol, rock asphalt paving 0.572 mi. State Hy. 64, Garfield Co. $46,079; 1.663 mi. State Hy. 270, Oklahoma Co. $8,756; concrete paving 0.22 mi. U. S. Hy. 64, Tulsa Co., $8,700; 2.046 mi. State Hy. 66, Oklahoma Co. $11,843; 0.161 mi. U. S. Hy. 64, Tulsa Co. $7,700; 3.374 mi. U. S. Hy. 54, Texas Co. C. L. Wilson, state hy. engr.

Pennsylvania—Aug. 10, at office S. S. Lewis, secy. Hys., Harrisburg, dual type paving, consisting of two 10 ft. outside lanes and 10 ft. center lane of bituminous surface course Spec. E on a native or modified broken stone base course pavement on 4,471 ft. R-126, Oxford Twp., Adams Co., involving 1,685 cu.yd. Class 1, 1,234 cu.yd. Class 2, and 9,370 cu.yd. borrow excav.; either bituminous penetration surface course or bituminous surface course, Spec. E on native stone or modified broken stone base paving, 1 rein.-con. bridge, 1 rein.-con. arch bridge, grading, road approach 14,682 ft. R-705 Parks Twp., Armstrong Co., 62,139 cu.yd. Class 1, 565 cu.yd. Class 2, 3,328 cu.yd. borrow excav; bituminous surface course Spec. E on broken stone base course, etc. 2,944 cu.yd. R-160, Sect. 5, Ontelaunee Twp., Berks Co., 6,852 cu.yd. Class 1 and 1,005 cu.yd. Class 2 excav.; rein.-con. arch bridge, R-260, Sects. R-7 and R-3, Catharine and Morris Twps., Blair and Huntingdon Counties, 30,226 cu.yd. Class 1 and 1,079 cu.yd. Class 2 excav.; rein.-con. paving, grading road approach, 16,410 ft. R-34, Sect. 1-A, Silver Spring and Middlesex Twps., Cumberland Co., 20,298 cu.yd. Class 1, 1,103 cu. yd. Class 2 and 24,670 cu.yd. borrow excav.; steel stringer bridge R-294, Wayne Twp., Crawford Co., 868 cu.yd. Class 1 and 35 cu.yd. Class 2 excav.; rein.-con. paving and 5 rein.-con. structures 15,900 ft. R-200 and 367, R-367 Sect. 3, Corry, Spartansburg Boro, Sparta Twp., Crawford and Erie Counties, 19,118 cu.yd. Class 1, 3,711 cu.yd. Class 2 and 614 cu.yd. borrow excav.; rein.-con. paving, incl. 2 rein.-con. structures, drainage, 11,876 ft. R-67 and 301, Sects. R-1, R-2, A and B, Indiana Boro, White Twp., Indiana Co., 17,756 cu.yd. Class 1 and 1,533 cu.yd. Class 2 excav.; rein.-con. paving 4,950 ft. R-33, Oliver Twp., Mifflin Co., 5,578 cu.yd. Class 1, 228 cu.yd. Class 2 and 299 cu.yd. borrow excav.; rein.-con. paving, incl. 2 rein.-con. bridges, bituminous surface treated macadam surface course paving 10,786 ft. R-161 Sects. 9-A and 9-B, Coal and Mt. Carmel Twps., Northumberland Co., 22,732 cu.yd. Class 1, 446 cu.yd. Class 2 and 6,157 cu.yd. borrow excav.; plate girder and pipe truss bridge, widening existing concrete pavement with rein.-con., 886 ft. R-161, Sect. 5, St. Clair Boro, Schuylkill Co., 200 cu.yd. Class 1, 606 cu.yd. Class 2 and 3,784 cu.yd. borrow excav.; rein.-con. paving, dual type paving rein.-con. bridge, 12,770 ft. R-126, West Manchester Twp., York Co., 16,161 cu.yd. Class 1, 588 cu.yd. Class 2 and 4,000 cu.yd. borrow excav.

Pennsylvania—At office S. S. Lewis, secy. Hys., Harrisburg, rejected bids June 15, grading, drainage, 1,500 ft. three track deck plate girder overhead bridge R-281, Parallel, Sect. 4, Middletown Twp., Bucks Co., P.W.A. project. Noted June 7.

Pennsylvania—Aug. 14, at office of S. S. Lewis, secy. Hys., Harrisburg, rein.-con. widening 10,337 ft. Route 246, Sect. 6-A and 7, Ross and McCandless Twps., Allegheny Co., involving 101,620 cu.yd. Class 1 and 1,844 cu.yd. Class 2 excav.; bituminous penetration surface course paving 21,381 ft. R-278, Sect. 5, Greene and Hanover Twps., Beaver Co., 55,373 cu.yd. Class 1, 3,175 cu.yd. Class 2 and 552 cu.yd. borrow excav.; dual type paving, rein.-con. bridge, rein.-con. culvert 9,860 ft. R-131, Sect. 5, London Grove and Penn Twps., Chester Co., 86,309 cu.yd. Class 1 and 461 Class 2 excav.; rein.-con. paving 17,549 ft. R-351, Sect. 2, Waterford Boro, Waterford Twp., Erie Co., 17,578 cu.yd. Class 1, 2,877 cu.yd. Class 2, 3,244 cu.yd. borrow excav.

Wash., Port Angeles—Comrs. Clallam Co., rejected bids July 20, surfacing 5 mi. Secondary Rd. Project 22, Mount Angeles Rd. T. F. Rixon, city engr.

Wisconsin—Aug. 10, by State Hy. Comn., Madison, grading, draining, 4.81 mi. Sister Bay Gillis Rock Rd., County Hy. B, N.R.S. 494-A, Door Co., incl. 41,382 cu.yd. excav.; concrete paving 72,445 sq.yd. Stoughton-Madison-Portage Rd., U. S. Hy. 51, S.A.P. 1520, Columbia Co.; graveling 1.641 mi. Pittsville-Niellsville Rd., S.T. Hy. 73, N.R.S. 517-A, Clark Co.; 7.175 mi. Prairie du Chein-Lynxville Rd., Crawford Co.; constructing Gillett Bridges 1 and 2, Village of Gillette, Oconto Co.; 7.226 mi. bituminous foot path projects N.R.H. E-352-C N.R.S. 530, 531, 533, 535, 536, 537 and 538; concrete foot paths, 0.238 mi. N.R.S. 534-A, both Milwaukee Co.

†Wyoming—Pub. Rds., Denver, Colo., recalled bids to have been opened July 25, base course oiling 35.95 mi. roads in Teton and Sublette Counties. Will readvertise. Noted July 19.

Ont., Port Arthur—See "Contracts Awarded."

CONTRACTS AWARDED

Arkansas—State Hy. Comn., Little Rock, grading, drainage structures, traffic service gravel surfacing 3.5 mi. Siloam Springs-Springdale Rd., Benton Co., to Gaines Bros., Miami, Okla., $37,477. Bids July 18, awarded July 20. W. W. Zass, State Hy. Comn., Little Rock, engr.

Colorado—State Dpt., Denver, rock asphalt surfacing 0.718 mi. hy. in Olathe on State Hy. 6, N.R.M. 23-D, to H. Shore, Grand Junction, $26,994; 0.539 mi. hy. in city of Ouray, State Hy. 19, N.R.M. 293-E, Ouray Co., to H. C. Lallier Contg. & Eng. Co., 6001 West 13th Ave., Denver, $26,758. Bids July 11, awarded July 18.

Colorado—State Hy. Dpt., Denver, city improvement project on 0.813 mi. hy. in city of Boulder, Stat Hy. 7, N.R.M. 13-B, Boulder Co., to Western Paving & Contg. Co., 5230 Washington St., Denver, $27,314. Bids July 14, awarded July 19.

†Colorado—Bu. P. Bds., Custom House, Denver, surfacing 2.105 mi. road in Marimer Co., to Steamboat Transfer & Storage Co., Steamboat Springs, $18,152. Bids July 2. Noted June 28.

Connecticut—State Hy. Comn., J. A. Macdonald, state Hy. comr., to D. Arrigoni, Inc., Middletown, waterbound macadam paving 7,821 ft. Killingsworth Rd. Federal Emergency Administration of P. Wks. Project Docket 5874, Chester, $49,968***to John Arborio, Inc., West Cedar St., Poughkeepsie, N. Y., 9,807 ft. Sandisfield Rd., Colebrook and Norfolk, $58,589***to Lane Constr. Co., 37 Colony St., Meriden, 2½ in. bituminous macadam on 6 in. trap rock paving 1,956 ft., Andover-Hebron Rd., Andover, $19,101; rolled bank run gravel surfacing 7,377 ft., William Miller and Old Jewett City Rds., Preston, $11,645***to Arborio Road Constr. Co., Waterbury, rein.-con. paving 805 ft. curve elimination on U.S. Route 6, Plainville, $11,422***to John Pascone & Sons, Inc., 74 Steuben St., Bridgeport, trap rock waterbound macadam paving 9,273 ft., Bushy Hill Rd., Simsbury, $33,310; rolled bank run gravel paving 8,350 ft., Parish Hill and Pumpkin Hill Rds., Chaplin, $13,258; 6,530 ft., Erdoni Rd., Columbia, $14,592***to G. Lanzetto & J. Marcelle, Inc., Dedham, Mass., lose gravel surfacing 9,175 ft., Hampton Hill and Brook Rds., Hampton, $10,695***to F. D. Miller, R.F.D. 6, Norwich, 8,185 ft. Jared Brown Rd., Stonington, $11,467***to Bridges Constr. Corp., Hazardville, 7,581 ft. Beaver Hill and Love Lane Rds., Windham, $10,167. Grand total $244,214. Bids July 9. **P.W.A.** Noted July 5.

Georgia—State Hy. Bd., Atlanta, paving 10.899 mi. Buena Vista-Cusseta Rd., Marion Co., involving 22,449 cu.yd. excav., to M. J. Carroll, Inc., Ocala, Fla., $92,476***5.23 mi. Carnesville-Lavonia Rd., Franklin Co., 12,093 cu.yd. earth excav., to S. E. Finley, North Ave., Atlanta, $66,167***1,008 mi. Lyons-Savannah Rd., Tatnall Co., 9,472 cu.yd. earth excav., to J. R. Cothran, 3472 Piedmont Rd., Atlanta, $22,131***grading, etc., 2.805 mi. Gibson-Wren Rd., Glascock Co., 68,694 cu. yd. earth excav., etc., to M. R. Woodall Co., Inc., 1594 Lakewood Ave., S.E., Atlanta, $31,458***5,931 mi. Alma-Patterson Rd., Bacon Co., 101,154 cu.yd. earth excav., to W. C. Shepherd, 347 Elizabeth St., N.E., Atlanta, $52,231***1,864 mi. Albany-Americus, Macon and Albany-Americus and Atlanta Rds., Sumter Co., 95,195 cu.yd. earth excav., to W. L. Florence Constr. Co., Powder Springs, $31,387***2 bridges on Alma-Patterson Rd., Bacon Co., to C. T. Felix, St. Petersburg, Fla., $19,578***1 bridge over Cypress Creek, on Fargo-Lake City Rd., Clinch Co., to Pettus Constr. Co., Montgomery, Ala., $9,470***bridge on Albany-Americus-Macon Rd., Sumter Co., to G. W. Darnell & Sons, Rabun Gap, $9,500. Grand total $334,398. Bids July 12. Noted July 5.

Ill., Lewiston—Dpt. P. Wks. & Bldgs., Div. Hys., traffic bound surfacing 1.4006 mi. Sect. 5MFT State Aid Route 8, to Plack Transfer Co., Peoria, $5,601; 5.102 mi. State Aid Route 13, Sect. 13MFT, to C. L. Swords, Peoria, $24,690, both projects in Fulton Co. Bids July 17. Noted July 12.

Indiana—State Hy. Dpt., Indianapolis, concrete structures on road in Shelby Co. and concrete paving Franklin and Dearborn Counties, to Stein Kamp & Co., Batesville, $33,579 and $8,688 respectively est. $37,741 and $8,881 respectively. Bids July 10. Noted July 5.

Kentucky — State Hy. Comn., Frankfort, grading, draining 4.013 mi. Jackson-Salyersville Rd., Breathitt Co., to Ralph E. Mills Co., Frankfort, $48,469; 0.014 mi. West Liberty-Sandy Hook Rd., Morgan Co., to Codell Constr. Co., Winchester, $51,606. Bids July 12, awarded July 25. Balance of awards held in abeyance. Noted June 28.

La., Shreveport—Mayor and City Commissioner, paving Southern Ave., to A. C. Campbell, Shreveport, $25,600.

La., Shreveport—Mayor and City Comn., paving St. Vincent Ave., North Market and Cresell Sts., and resurfacing various streets, to Flenniken Constr. Co., Shreveport, $92,703.

Md., Baltimore—Bd. awards, concrete paving 8,450 sq.yd. streets, Contr. 645, to Mahoney Bros., 1111 Rutland Ave., $28,891. Bids July 11.

Massachusetts—Commonwealth of Massachusetts, Dpt. P. Wks., F. E. Lyman, comr. and H. A. Meachan, chn. Bd. Selectmen, Dalton, stone and tar hy., mixed in place, 6,617 ft. hy., Dalton, to Carl B. Lindholm, Jefferson St., Pittsfield, $17,396***Commonwealth of Massachusetts and J. J. Shea, chn. Bd. Selectmen, Dedham, bituminous macadam paving 3,935 ft. hy. Dedham, to M. McDonough Co., Bway., Malden, $18,745***Commonwealth of Massachusetts and K. C. Ford, chn. Bd. Selectmen, Sheffield, 50 ft. steel stringer bridge with rein.-con. floor over Schenob Brook, Sheffield, to J. Averso, 407 Water St., Fitchburg, $5,915. Grand total $42,056. Bids July 24. Noted July 19, under "Bridges and Grade Crossings."

Mass., Cambridge—Commonwealth of Massachusetts, Metropolitan Dist. Comn., D. B. Keniston, comr., 20 Somerset St., Boston, bituminous macadam paving Memorial Dr. from Cottage Farm Bridge to River St., to J. P. Condon Corp., 143 Waverly Ave., Watertown, $35,721. Bids July 19, awarded July 21.

Mass., Edgartown—Town, Bd. Selectmen, Town Hall, bituminous concrete surfacing in streets to M. F. Roach & Sons, Inc., Spring St., East Bridgewater, $57,925. **P.W.A.** Bids June 12, awarded July 20. Noted June 7.

Mississippi—E. D. Kenna, dir. Hys., Jackson, grading, drainage structures, bridges 5.429 mi. Hollandale-West Hy., involving 20,000 cu.yd. common earth excav., N.R.S. 262, Washington Co., to Burdine Constr. Co., Shaw, $44,861, est. $22,000. **P.W.A.** Bids July 24.

N. J., Little Falls—City bids early in August, improving streets. $41,000. P.W.A. project. P. S. Boughtman, Cedar Grove, engr.

†*Federal Government*

Streets and Roads (Continued)

†New Mexico—Pub. Rds., Denver, Colo., grading, draining, bridging 1.868 mi. in Catron Co., to Skousen Bros., Rodeo, $87,379. Bids July 6.

†New Mexico—Pub. Rds., Dpt. Agriculture, Denver, Colo., oil processing roadbed 16.797 mi. Carrizozo-Roswell and Hondo-Mescalero Rd., Lincoln Natl. Forest, Lincoln Co., to Cook & Ramson, Ottawa, Kan., $23,536. Bids July 3.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., to Zumme Constr. Co., 9212 212th St., Bellaire, grading 32nd St., $2,376; 62nd St., $2,393; Olcott St., $2,313; 65th St., $3,391; 37th Ave., $2,943***to Winfield Contg. Co., 72-02 51st Ave., Winfield, Dartmouth St., $5,747; 65th St. $18,700; 64th St. $2,661; 21st St. $4,020 ***to D. Rapone, 147-40 Arlington Terrace, Jamaica, 89th St., $2,067***to Elk Contg. Co., 1206 East 34th St., Brooklyn, 72nd Ave. $28,785***to W. P. McDonald, 33-04 Lawrence St., Flushing, 23rd Ave. $17,049; Liberty Ave. $51,123; 151st St., $5,698***to Sprague Constr. Co., Almeda Ave., Rockaway Beach, Dickens Ave. $39,063. Bids July 2. Grand total $188,329. Noted June 28.

N. Y., New York—S. Levy, pres. Manhattan Boro, Municipal Bldg., asphalt block paving Bank St., to Highway Impvt. Co., 50 Church St., $12,463; West 81st St., to Venetian Contg. Co., 2 Lafayette St., $17,268. Bids June 27. Noted June 21.

North Carolina—State Hy. & P. Wks., Raleigh, to Blythe Bros., 422 South Brevard St., Charlotte, asphalt on concrete paving 0.63 mi. Project 6506, $55,549; 0.65 mi. Project 6553, $57,000; 0.12 mi. Project 6554, $6,520, all foregoing in Mecklenburg Co.***to Reed & Abee, Inc., Asheville, bituminous concrete on concrete paving 0.7 mi. P. 8370, Henderson Co. $7,659. Grand total $126,728. Rejected bids July 17, bituminous surface treating 0.83 mi. Project 2033, Carteret Co.

North Dakota—State Hy. Comn., Bismarck, to Rue Bros., Bismarck, paving, sidewalks, 1.501 mi. Burleigh Co. $24,676; painting bridge, McKenzie and Mountrail Counties $4,400*** to Iowa Road Building Co., 1495 Keo Way, Des Moines, Ia., re-oiling 11.074 mi. Cass Co. $4,982; 15.14 mi. Richland Co. 7,611***to W. Coman, Goodrich, regraveling 23.884 mi. Cass and Richland Counties $20,736***to Butler Constr. Co., Grand Forks, 27.517 mi. Pembina and Walsh Counties $42,692***to F. M. Loutzenhiser, Bismarck, grading 15.118 mi. Bottineau Co. $30,343***to O. E. Miller, Bismarck, 7.183 mi. Grant Co. $19,689***to A. Campbell, Warwick, 6.951 mi. Pierce Co. $17,162; 6.074 mi. same county $13,868***to W. H. Noel, Jamestown, 5.215 mi. Bottineau Co. $10,305; 9.958 mi. Mountrail Co. $25,485***to M. B. Monson, Bismarck, 10.204 mi. Mountrail Co. $31,126***to N. W. Constr. Co., Bismarck, 9.448 mi. Cavalier Co. $14,578***to Fargo Bridge & Iron Co., Fargo, structural work, Grant Co. $5,540***to W. Collins, Fargo, grading, structural work Foster Co. $13,588***to N. W. Nursery Co., Valley City, landscaping 0.539 mi. Barnes Co. $2,740***to A. Graff & Co., 111 West Washington Blvd., Chicago, Ill., oil mix paving 2.552 mi. Richland and Sargent Counties $45,786; 1.624 mi. Burke and Ward Counties $39,813; 1.171 mi. Ransom Co. $25,997***to Haggart Constr. Co., Fargo, 2.322 mi. Mountrail Co. $44,841; 1.471 mi. Mercer Co. $38,421***to T. M. Swingen, Cooperstown, 0.617 mi. Foster Co. $21,992***to Megarry Bros., Bismarck, 1.77 mi. Hettinger Co. $30,414. Grand total $536,795. Rejected bids oil mix paving Towner Co. and received no bids oil mix paving McHenry Co. Bids July 20. Noted July 12.

Ohio—O. W. Merrell, dir. Hys., Columbus, grading, draining, concrete base and curb, relaying existing sidewalks, brick paving, incl. furnishing, delivering brick 1.583 mi. Sect. "Wellsville" Ohio River Rd., Columbiana Co., to G. B. Patterson, 1200 Main St., Wellsville, $138,241***cold mixed asphaltic concrete resurfacing 3 mi. Kenton-Wapakoneta Rd., Hardin Co., to Ohio Road Impvt. Co., 30 East Broad St., Columbus, $23,722***bituminous material surfacing 38.57 mi. hys. in Ashtabula, Geauga and Trumbull Counties, to Allied Products Co., 714 Keith Bldg., Cleveland, $67,752. Grand total $229,715. **P.W.A.** Bids July 14.

Ohio—O. W. Merrell, dir. Hys., Columbus, grading, draining, waterbound macadam widening base and hot laid asphaltic concrete resurfacing 2.497 mi. Columbus-Sandusky Rd., Erie Co., and concrete paving 2.189 mi. Sandusky-Southern Rd., Erie Co., to Thompson Paving & Constr. Co., 4232 N. Haven Ave., Toledo, $85,118 and $72,198 respectively. **P.W.A.** Rejected bids bituminous paving 0.2066 mi. Sect. "C" (part) Newark-New Lexington Rd., Perry Co., $5,573. Bids July 13.

Ohio—O. W. Merrell, dir. Hys., Columbus, hot mixed asphaltic concrete paving, adjusting catch basins and manholes 0.79 mi. Allen and Van Wert Counties, to Churchill, Inc., 835 East North St., Lima, $18,225***hot mixed asphaltic concrete paving 1.243 mi. Sect. "DE" Plymouth-Bucyrus Rd., Crawford Co., to Mansfield Asphalt Paving Co., rear 31 Orange St., Mansfield, $27,802***widening and concrete paving 0.347 mi. Fayette Co., to W. H. Ringwald & Sons Co., 42 East 2nd St., Chillicothe, $14,319***concrete paving 2,017 ft. and widening, asphaltic concrete resurfacing 4,688 ft. Knox Co., to S. Monroe & Son Co., 2640 Gallia St., Portsmouth, $65,018***brick paving, incl. furnishing,delivering brick, 0.212 mi. Knox Co. to E. H. Newell, 114 Woodland Ave., Columbiana, $13,773***0.642 mi. Dayton-Troy Rd. and bituminous macadam surface course paving 0.211 mi. Brookville-Arlington Rd., Montgomery Co., to Finke Eng. Co., 116 South Perry St., Dayton, $23,884 and $11,358 respectively ***cold mixed asphaltic paving 0.336 mi. hy. and constructing steel beam bridge, Morrow Co., to Uncapher & Gillespie, 689 East Center St., Marion, $30,377***concrete paving 0.8 mi. Richland Co., to O'Connor-Kipf Co., 2006 St. Clair Ave., Cleveland, $27,742***0.3488 mi. Williams Co., to J. A. Elder, Bryan, $10,542***widening, extending drainage structures, bituminous macadam surface course paving 2.6955 mi. Vinton Co., to Wood, Shipley & Miller Bros., McArthur, $49,591. Grand total $292,631. Bids July 13.

Ohio—O. W. Merrell, dir. Hys., Columbus, bituminous macadam paving 11.178 mi. sections various roads, Ashland Co., to H. J. Hart, Elyria, $12,199***bituminous material surfacing 20.8 mi. Belmont, Guernsey and Harrison Counties and 26.76 mi. Coshocton, Knox and Muskingum Counties, to Edgar Spring, Inc., 630 Bway., New Philadelphia, $17,409 and $43,632 respectively***20.08 mi. Brown and Clermont Counties, to Tri-State Constr. Co., Cincinnati, $24,408***41.05 mi. Champaign, Clark, Darke and Mercer Counties, to Bowsman Washed Sand & Gravel Co., Troy, $29,485*** bituminous surface treating 2 applications, incl. dragging and rolling 16.665 mi. roads Crawford Co. and bituminous material surface treating 21.26 mi. roads Fairfield and Perry Counties, to C. E. Edgington, Findlay, $12,068 and $25,886 respectively***9.4 mi. Madison Co. and drag treatment patching and bituminous material surfacing 14.25 mi. Pickaway Co., to T. D. Camp, 55 East State St., Columbus, $6,514 and $11,796, respectively***8.19 mi. Marion and Wyandot Counties, to U. S. Constr. Co., 434 South 8th St., Upper Sandusky, $6,459***5.4 mi. Mercer Co., to L. Cossett, 321 West Front St., Findlay, $17,424***31.15 mi. Stark, Portage and Summit Counties, to Mahoning Contg. Co., Warren, $21,314. Grand total $228,594. Bids July 13. Rejected bids July 13, bituminous surface treating 29.48 mi. roads in Williams and Woods Counties.

Ohio—O. W. Merrell, dir. Hys., Columbus, concrete paving 0.303 mi. Sect. "F" (Part) Cincinnati-West Union Rd., Hamilton Co., to Hodges Constr. Co., 1051 Flint St., Cincinnati, $37,074***traffic bound surface course paving 1.775 mi. Canal Fulton-Brewster Rd., Stark Co., to Edgar Spring, Inc., New Philadelphia, $25,361. Bids July 13.

Pennsylvania—S. S. Lewis, secy., Hys., Harrisburg, rein.-con. paving and constructing 2 span steel truss and through plate girder bridge on 1,816 ft. R-68, Sect. 9, Blairsville Borough, Derry Twp., Indiana and Westmoreland Counties, to Freeland, McHale & Patten, Inc., 1 Penn Ave., Pittsburgh, $176,499. **P.W.A.** Bids July 13. Noted July 5.

Pennsylvania—At office S. S. Lewis, secy. hys., Harrisburg, rein.-con. paving and Spec. "A" surface on plain concrete, Spec. "A" on broken stone base for side approaches of rigid frame steel structure, on 0.35 mi. hy. City Ave., Sect. 4, city of Philadelphia and Merion Twp., Philadelphia and Montgomery Counties, to Kaufman Constr. Co., 1505 Race St., Phila., $150,987. P.W.A. project. Bids July 3.

Pa., Washington—Washington Co., asphalt resurfacing Beallsville-Fredericktown Rd., Taylor Run Rd., Finleyville-Venetia Rd., to Hull Resurfacing Co., R.F.D. No. 7, Butler, $60,000 ***materials for this work, to Vang Co., Grant Bldg., Pittsburgh, $4,000***additional contract for material, to Pittsburgh Asphalt Products Co., 1101 Western Ave., Pittsburgh, $3,510. Grand total $67,510.

R. I., Providence—City, Comr. P. Wks., City Hall, bituminous macadam penetration paving 1 mi. Dudley, Arnold and Keene Sts. and Branch Ave., to T. J. Quinn & Son, Inc., 95 Fountain St., $49,822.

Tennessee—State Hy. Dpt. & P. Wks., Nashville, grading, draining, paving 0.335 mi. Hy. 1, N.R.M. 70-B, Haywood Co., to Walker & Michael, P. O. Box 850, Memphis, $21,991*** 0.518 mi. State Hy. 2, N.R.M. 208-B, Rutherford Co., to Foster & Creighton Co., American Bank Bldg., Nashville, $27,273***0.656 mi. Hy. 11, N.R.M. 255-E, Davidson Co., to Municipal Paving & Constr. Co., Cotton States Bldg., Nashville, $77,697***grading, draining 2.765 mi. Hy. 66, N.R.S. 409-A, Hawkins Co., to T. L. Strider & Co., Cotton States Bldg., Nashville, $36,000***grading, draining, surfacing 4.024 mi. N.R.S. 410-A, Sumner Co., to Inter-State Constr. Co., Independent Life Bldg., Nashville, $36,364***grading, draining 5.624 mi. Hy. Sect. of Route 82, N.R.S. 411-A, Bedford Co., to Lebanon Bridge Co., c/o Sam Davis Hotel, Nashville, $29,545. Grand total $228,870. Bids July 20, awarded July 21. Noted July 12.

Texas—G. Gilchrist, state hy. engr., Austin, to Standifier Bros., Big Wells, grading, drainage structures 9.049 mi. State Hy. 111, S.P. 1070-C, Jackson Co., $34,540 est. $40,000***to Huddleston & Work, Crosbyton, 4.463 mi. State Hy. 18, S.P. 834-B and C, Kent Co., $23,363 est. $30,000; 13.481 mi. State Hy. 28, State Project 857-G, Lamb Co., $18,772 est. $20,000; 9.569 mi. State Hy. 89, S.P. 175-D, Palo Pinto Co., $75,113 est. $100,000***to J. Lee & E. A. Vilbig, 2517 Eakin St., Dallas, 13.16 mi. State Hy. 15, S.P. 503 and 398, Nueces Co., $63,373 est. $80,000***to Harrison Eng. & Constr. Corp., 903 Fairfax Bldg., Kansas City, Mo., grading, concrete paving 7.607 mi. State Hy. 73, S.P. 800-B, Harris Co., $140,926 est. $160,000; concrete paving, large drainage structures 7.821 mi. State Hy. 35, S.P. 556-A and B, Shelby Co., $224,717 est. $200,000***to Holland Page, Norwood Bldg., Austin, grading, drainage structures, iron ore top soil base course with road oil surface treatment 1.863 mi. State Hy. 25, S.P. 273-B, Nacogdoches Co., $33,764 est. $30,000; triple asphalt surface treating 8.744 mi. State Hy. 176, S.P. 1028A, Smith Co., $37,368 est. $40,000; double bit surface treatment and bridge surfacing 11.569 mi. State Hy. 19, S.P. 417-B, Anderson Co., $27,457 est. $30,000; to Austin Bridge & Road Co., 1813 Clarence St., Dallas, grading drainage structures, pavement for roadway and 2 railway underpasses 2.385 mi. State Hy. 50, Montague Co., $122,180 est. $120,000; concrete paving, iron ore topsoil base course and double asphalt surface treating 15.324 mi. State Hy. 8, S.P. 49 D and 545, Jasper Co., $326,357 est. $300,000***to W. W. Vann & Co., Mercedes, grading small drainage structures, bituminous surface treating 10.292 mi. State Hy. 27, S.P. 202-B, Kerr Co., $211,738 est. $200,000***to R. W. McKinney, Nacogdoches, road oil prime coat and double asphalt surface treating 7.225 mi. State Hy. 28, S.P. 857-A and 763-A, Motley Co., $20,620 est. $20,000; waterbound broken stone macadam with triple asphalt surface treating 2.246 mi. State Hy. 79, S.P. 841 A and B, Throckmorton and Young Counties, $67,064 est. $70,000*** to J. S. Moore & Sons, Lufkin, grading, drainage structures, iron ore topsoil base course with triple asphalt surface treatment 9.107 mi. State Hy. 176, S.P. 1028-B, Smith Co., $61,640 est. $70,000***to Lone Star Constr. Co., 423 Seguin Rd., San Antonio, crushed gravel base with triple asphalt surface treatment 6.858 mi. State Hy. 1, S.P. 142, Unit 2, Jeff Davis Co., $96,679 est. $80,000. Grand total $1,585,677. Bids July 16. Noted July 12 and 19.

Texas—G. Gilchrist, state hy. engr., Austin, concrete paving 0.2 mi. State Hy. 20, Travis Co., to Holland Page, Norwood Bldg., Austin, $23,038, est. $30,000***grading, drainage structures and concrete paving 1.167 mi. State Hy. 15, Tarrant Co., to Earl Yates & Son, Dallas, $121,407, est. $140,000***gravel and concrete base course, hot mixed limestone rock asphalt surface course paving 2.45 mi. State Hys. 2, 3 and 27, Bexar Co., to H. B. Zachry, Laredo and Colglazier & Hoff, Inc., 326 Seguin Rd., San Antonio, $184,459, est. $200,000. Grand total $328,904. P.W.A. project. Bids July 16. Noted July 12 and 19.

Utah—State Rd. Comn., Salt Lake City, grading, draining, surfacing 5.859 mi. road in Salt Lake Co., to F. S. Whiting, Kaysville, $70,556. **P.W.A.** Bids July 26.

Utah—State Hy. Comn., Salt Lake City, grading, draining graveling 5.326 mi. Weber Co., to A. O. Thorne, Springville, $40,282. Est. $46,481. **P.W.A.** Bids July 16.

Wash., Prosser—Benton Co., oiling 28.2 mi. road, to Hewett & Judd Constr. Co., Seattle, $38,941. Bids July 6. Noted June 28.

†Wyoming—Pub. Rds., Denver, Colo., grading, draining roadbed 13.767 mi. Grand Loop Hy., Yellowstone Natl. Park, to Morrison-Knudsen, Boise, Idaho, $188,127. Bids July 5.

Ont., Forest Hill Village—Village, to Kilmer, Gibson & Van Nostrand, Fleet St., Toronto, asphalt on concrete paving St. Clement Ave., $6,208; Briar Hill Ave., $3,705***to Constructing & Paving Co., Ltd., Fleet St., Toronto, Cheyne Ave., $3,634; Wembley Ave., $5,143; Kilbarry Ave., $4,970; repairing miscellaneous streets $1,072***to Godson Contg. Co., 203 Richmond St. W., Toronto, Delevan Ave., $4,853. Grand total $29,586.

Ont., Port Arthur—City, concrete paving Cumberland St., to Barnett McQueen Constr. Co., 460 Christina St., Fort William, at $1.85 per sq.yd.; graded asphaltic concrete surfacing Cumberland St., to Carter Halls-Aldinger Co., Cherry and Mill Sts., Toronto, at $1.25 per sq.yd. Noted July 12.

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†*Federal Government.*

Streets and Roads (Continued)

†Puerto Rico—U. S. Eng., macadam paving 3.5 mi. kilometers, to V. Santos, Morovis, Puerto Rico, $17,606.

†Puerto Rico—U. S. Eng., Wash., D. C., 5.8 kilometers of macadam road and 22 culverts near Aquadilla, to G. Esterves, San Juan, $31,078.

EARTHWORK, IRRIGATION DRAINAGE AND WATERWAYS

PROPOSED WORK

Calif., Alturas—Big Valley Irrigation Dist. plans irrigation storage reservoir on Pitt River. $250,000. $160,000 allotted by P.W.A.

Calif., Costa Mesa—Newport-Mesa Irrigation Dist., Fairview Farms Water Co., Santa Ana Heights Water Co., and Newport Heights Irrigation Dist., are considering proposal to interconnect four water systems of Costa Mesa to effect economies in operation in installation of diesel engines is under consideration.

Calif., Laguna Beach—Private Interests, tentative plans completed constructing 400 ft. pier, and 500 ft. breakwater extension to pier. $200,000. A. J. Stead, 490 Thalia St., engr.

Calif., Los Angeles—Flood Control Dist., 205 South Bway., E. C. Eaton, engr., will expend about $20,000 to prepare county reservoirs for winter flood season, incl. removing debris around valves, Pacoima Dam, $1,000; repairing gate seats and trash net, Devils Gate dam, $1,700; installing 2 needle valves, Big Santa Anita Dam, $2,000; replacing shear pin Pelton Valve, Big Dalton Dam, $1,500; altering spillway, Haines Canyon Debris Dam, $8,500.

Calif., Modesto—Modesto Irrigation Dist. plans installing concrete lining of canals and construct new structures in main channel, $165,000, and construct 2nd circuit on transmission line, Don Pedro Power House to Modesto $65,000. P.W.A. allotted $225,000 loan and grant, and bond election will be necessary to secure loan. B. W. Greim, Modesto, electrical engr. N. M. Cecil, Modesto, irrigation engr.

Calif., Redwood City—San Mateo Co., election Aug. 28, $450,000, improving harbor, incl. wharves, warehouses, spur tracks, channel and turning basin. $635,000. Applied for $185,000 P.W.A. loan and grant. Noted Apr. 19.

†Ill., Chicago—U. S. Eng., 932 Post Office Bldg., making plans constructing capstans at all locks on Illinois Waterway.

†Ill., Joliet—U. S. Eng., Post Office Bldg., making plans brick, stone rein.-con. control house, at Brandon Rd. Lock, near here.

Kan., Council Grove—Cottonwood Development Co., Inc., c/o Clark E. Jacoby Eng. Co., engrs., 312 Interstate Bldg., Kansas City, Mo., plans dam on Neosho River to regulate low waterflow. $2,000,000. Will apply to P.W.A. for loan and grant. Noted May 31.

La., Baton Rouge—State Hy. Comn., Baton Rouge, asked permission of U. S. Engineers to build timber and sheet piling bulkhead at entrance to canal entering Chef Menteur Pass, Orleans Parish.

†Pennsylvania—U. S. Eng., Gimbel Bldg., Phila., Pa., plans dredging Delaware River. $750,000 P.W.A. funds allotted.

Tex., Barstow—Ward County Irrigation Dist. 1, plans canals, etc., irrigation, drainage project. P.W.A. authorized $63,000 loan.

Tex., Clarksville—Red River Co. Levee Impvt. Dist. 1, plans excavation, drainage work, etc. P.W.A. authorized $41,000 loan.

Tex., La Feria—La Feria Water Control & Impvt. Dist., Cameron Co., plans irrigation work, etc. P.W.A. authorized $502,500 loan.

Wash., Bellingham—Bd. Comrs. Whatcom Co. plans flood control work. $13,000 assisted by P. Wks. funds.

BIDS ASKED

†Louisiana—Aug. 8, by U. S. Eng., 2nd Dist., foot Prytania St., New Orleans, 886,000 cu.yd. earthwork in 2nd New Orleans Dist.

Nebraska—Aug. 16, by Platte Village Public Power & Irrigation Dist., North Platte, constructing Sutherland Reservoir of the Sutherland Project, Lincoln Co., incl. 1,400,000 cu.yd. earth embankment, 600,000 cu.yd. miscellaneous excav., 40,000 cu.yd. concrete and other items. P.W.A. project. D. D. Price, ch. engr. and genl. mgr. Parsons, Clapp, Brinckerhoff & Douglas, 142 Maiden Lane, New York, consult. engrs. Noted July 26.

New Hampshire—Aug. 7, at office State Hy. Comn., Concord, stone jetties, sand dikes, hydraulic fill in Hampton River, involving 18,600 tons heavy quarry grout, 4,500 tons stone chips, 8,600 tons rip rap, 2,850 cu.yd. crushed stone or coarse gravel. Est. $300,000. D. H. Dickinson, Concord, engr.

†New York—Aug. 8, by U. S. Eng., 1st Dist., Whitehall St., New York, dredging 144,960 cu.yd. and removing wreckage from East Rockaway (Debs) Inlet.

†Oregon—Aug. 16, by Bureau Reclamation, Vale, earthwork and structures on Vale Main Canal, near Vale and Jamieson; incl. 551,100 cu.yd. excav., Spec. 579.

†W. Va., Grafton—U. S. Eng., Pittsburgh, Pa., completing plans and takes bids about Aug. 21, constructing dam as part of flood control system for Pennsylvania, Ohio and West Virginia Dam on Tygart River, near here. $7,000,000.

†Wis., Fountain City—Aug. 8, by U. S. Eng., 615 Commerce Bldg., St. Paul, Minn., clearing pool area above Mississippi River Lock and Dam 5, near here.

Canada—Aug. 21, by Secretary Dpt. P. Wks., Ottawa, Ont., extension to pier, involving 14,100 lin.ft. round logs, 9,100 lin.ft. ballast poles, 37,000 ft. B.M. lumber, 11,000 lb. iron, 2,000 cu.yd. rock ballast, Fort Resolution, N.W.T. $18,000. K.M. Cameron, Dpt. P. Wks., Ottawa, Ont., engr. Noted July 5.

Que., Pointe au Pere—Aug. 7, by Secretary Dpt. P. Wks., Ottawa, Ont., wharf repairs, involving 87,900 ft. b.m. dismantling, 4,025 cu.yd excav., 183 units steel sheet piling, 66 units tie rods, 2,280 ft. b.m. square timber, 59,900 ft. b.m. flooring, 4,965 cu.yd. fill. $15,000. K. M. Cameron, Dpt. P. Wks., Ottawa, Ont., engr.

LOW BIDDERS

†Ariz., Parker—Bureau Reclamation, Grant Bldg., Los Angeles, Calif., July 26, constructing Parker Dam, from Six Companies, Boulder City, Nev., $4,239,834. Noted June 21.

CONTRACTS AWARDED

Calif., Sacramento—C. H. Merry, secy. of American River Flood Control Dist., 410 State Bldg., constructing flood retaining wall and plant building, involving 144 cu.yd. A and 35 cu.yd. B, 559 cu.yd. C Portland cement, 26,500 lb. reinforced steel, to Campbell Constr. Co., 800 R St., $16,425. Bids June 29, awarded July 23.

†Conn., New Haven—U. S. Eng., Providence, R. I., dredging 344 cu.yd. rock and 440 cu.yd. other material from New Haven Harbor, to P. Sanford Ross, 277 Washington St., Jersey City, N. J., $18,000. Bids July 6. Noted June 28.

†Ill., Moline—U. S. Eng., Rock Island, excavating and disposing all loose rock and loose material in channel Rock Island Rapids, in Mississippi River, at Wing Dams 9 and 39, to Powers-Thompson Constr. Co., Joliet, $263,000. Bids July 10. Noted June 21.

†Ill., Rock Island—U. S. Eng., core borings at site Moline Water Power Auxiliary dam in Mississippi River, to Spraque & Henwood, 224 West Olive St., Scranton, Pa., $1,106. Bids July 21.

†Nev., Reno—Nevada Emergency Drouth Relief Comn., constructing cofferdam and installing three 36 in. pumps to pump water from Lake Tahoe into Truckee River for irrigation, to Dodge Constr. Co., Fallon, $64,850.

New Jersey—State Hy. Comn., Trenton, repairing dikes at Raccoon and Oldman's Creeks, Gloucester and Salem Counties, to J. W. Powell, Inc., Salem, $19,130. Bids July 23.

†Tex., Port Aransas—U. S. Eng., Galveston, repairing jetties and furnishing stone to J. DePuy, Milam Bldg., San Antonio, $110,370. Bids July 2. Noted June 14.

Tex., Port Arthur—City, c/o H. O. Preston, mayor, seawall completion and drainage system, to J. B. Converse & Co., Port Arthur, $116,000. P.W.A. project. Noted July 19.

N. B., Escuminac—N. Desjardins, secy. P. Wks. Dpt., Ottawa, Ont., constructing breakwater extension, to H. N. Price, Moncton, $22,232. Bids July 17.

N. B., St. George—Secretary Dpt. P. Wks., Ottawa, Ont., dredging 24,900 cu.yd., to T. O'Leary, St. John, $12,699. Bids July 11.

N. B., Shippigan—Dpt. P. Wks., Ottawa, Ont., wharf repairs, to E. P. Laundry Ltd., Shippigan, $20,019. Est. $23,000. K. M. Cameron, Dpt. P. Wks., Ottawa, Ont., engr.

N. S., Broad Cove Marsh—Secretary Dpt. P. Wks., Ottawa, Ont., breakwater extension, to J. S. Moore and B. Mosher, Broad Cove. Est. $12,500. K. M. Cameron, Dpt. P. Wks., Ottawa, Ont., engr.

N. S., Malagash—Dpt. P. Wks., Ottawa, Ont., wharf extension to R. A. Douglas, New Glasgow, $23,455.

N. S., Meteghan—Dpt. P. Wks., Ottawa, Ont., wharf extension to F. S. Corneau, Corneauville. Est. $26,000. K. M. Cameron, Dpt. P. Wks., Ottawa, Ont., engr.

Ont., Hamilton—Dpt. P. Wks., Ottawa, piers, floats and pile clusters, to Russell Constr. Co., Ltd., Harbour Comm. Bldg., Toronto, $11,721. K. M. Cameron, Dpt. P. Wks., Ottawa, Ont., engr.

Ont., Kincardine—N. Desjardins, se[illegible] Dpt. P. Wks., Ottawa, revetment wall se[illegible] E. A. Henry & D. G. Ross, Kincardine, $13,4[illegible] Est. $18,000. K. M. Cameron, Dpt. P. Wks., Ottawa, engr. Noted July 11 Daily.

Ont., Port Burwell—Dpt. P. Wks., Ottawa, sheet pile protection wall, to Farley and Grant, Rideau St., Bank National Bldg., Ottawa, $12,953. Est. $20,000. K. M. Cameron, Ottawa, engr.

Quebec—Secretary Dpt. P. Wks., Ottawa, Ont., wharf reinforcement at Port Daniel East, to Ludger Lemieux Ltd., 267 St. Paul St., Quebec City, $18,977. Bids July 10. Noted July 5.

Que., Cap de la Madeleine—Dpt. P. Wks., Ottawa, Ont., wharf repairs to St. Francis Dredging Co. Ltd., Quebec City, $13,99[illegible] Est. $23,500. K. M. Cameron, Dpt. P. Wks., Ottawa, Ont., engr. Noted July 5 under "Canada."

UNCLASSIFIED

PROPOSED WORK

Colo., Pueblo—AIRPORT IMPROVEMENTS—City Council, G. W. Clark, city clk., plans improvements, incl. 2 concrete runways.

Kan., Kansas City—SWIMMING POOL—City voted $36,000, swimming pool.

Kan., Oswego—SWIMMING POOL—City election Aug. 7, $35,000 swimming pool. Wilson Eng. Co., Farmers Union Bldg., Salina, engrs. Noted July 19.

Mass., Chelsea—TANKS—American Oil Co., 31 St. James Ave., Boston, plans additional steel storage tanks, 306,000 bbl. capacity, $30,000. Private plans.

N. H., Rockingham Park—STABLES—New England Racing Assn., Rockingham Park, plans stables. To exceed $50,000. Architect not appointed.

N. Y., Astoria—SWIMMING POOL—Dpt. Parks, Arsenal Bldg., Central Park, New York, plans concrete swimming pool, Shore Blvd. and 23rd Ave. To exceed $25,000.

N. Y., Brooklyn—DOCK—Beard Estate, Pier B, Erie Basin, plans dock. $25,000 or more. Architect not appointed.

N. Y., Brooklyn—STORAGE TANKS, etc.—N. B. Goddard, c/o A. C. Goddard, 103 Park Ave., New York, bids in November or later, storage tanks, dikes, etc. Greenpoint and Kingsland Aves. $60,000. E. M. Wharff, 295 3rd Ave., New York, archt. Noted June 7.

N. Y., Brooklyn—SWIMMING POOLS—Dpt. Parks, Arsenal Bldg., Central Park, New York, plans swimming pools at Berry and Lorimer Sts. and in Sunset Park, 5th Ave. and 43rd St. To exceed $25,000.

N. Y., New York—SWIMMING POOLS—Dpt. Parks, Arsenal Bldg., Central Park, plans swimming pools at 173rd St. and Amsterdam Ave. at Hamilton Fish Park, Willet and East Houston Sts.; and at Thomas Jefferson Park, 1st Ave. and 112th St. To exceed $25,000.

N. Y., Schenectady—FEED and FUEL BINS—J. G. Hildebrandt, Inc., South Schenectady, plans rebuilding storage bins for feed and fuel destroyed by fire. $50,000. Engineer not appointed.

N. Y., St. Albans—SWIMMING POOL—Dpt. Parks, Arsenal Bldg., Central Park, New York, plans concrete swimming pool, Merrick Rd. and Linden Blvd. To exceed $25,000.

N. Y., West New Brighton—SWIMMING POOL—Dpt. Parks, Arsenal Bldg., Central Park, New York, plans concrete swimming pool. To exceed $25,000.

O., Marietta—AIRPORT—Plans airport near here. State Relief Comn. approved project. Est. $24,952.

Okla., Altus—SWIMMING POOL—City plans new swimming pool, low water bridge, road, park pavilion at Lake Lugert, near here. $100,000. P.W.A. funds allotted. W. L. Benham, Perrine Bldg., Oklahoma City, engr.

Tex., Gladewater—STADIUM—T. J. Sturdevant, pres., plans by E. K. Withers Arch. Co., 601 Holmes Bldg., Fort Worth, stadium with wood deck, steel construction, galvanized iron roof for athletic department.

Tex., Rankin—GAS DISTRIBUTION SYSTEM—City, c/o M. L. Harris, plans installing gas distribution system. $25,000 P.W.A. allotment approved. J. S. Pittman, Rankin, engr.

Que., St. Rose—TRANSMISSION LINE—Shawinigan Water & Power Co. Ltd. plans transmission line from Ste. Rose to Laval-Sur-de-Lac. **Maturity in August.**

BIDS ASKED

†D. C., Wash.—KIOSKS, etc.—Aug. 9, by Treas. Dpt. at office Sup. Archt., Wash., D. C., kiosks, pylons in triangle development.

†*Federal Government*

Unclassified (Continued)

Ill., Chicago—DROP DOORS—Aug. 7, by Bd. Educ., 728 North LaSalle St., 5 pr. front elevator and 1 pr. sidewalk drop doors, for elevator for Lane Technical High School, 7 pr. for front elevator at Wendell Phillips High School, 4 pr. for Steinmetz High School and 4 pr. at Wells High School.

Mich., Muskegon—GAS PIPE LINE—See "Contracts Awarded."

Miss., Vicksburg — CAST STEEL BALL JOINTS—U. S. Eng., cancelled bids to have been opened July 30, cast steel ball joints. Will readvertise. Noted July 24 Daily.

N. H., Dover—LIGHTING SYSTEMS—Aug. 7, by State, Toll Bridge Comn., Governor J. Wynant, chn. State House, Concord, constructing lighting systems at Little Bay and Bellany River Bridges.

North Carolina — ROOFING — Aug. 13, by State Hy. and P. Wks., Raleigh, roofing prisoners quarters at 2 prison camps, 1 at point 1½ mi. from Boone, Route 60, Watauga Co. and other 4 mi. southwest of Burnsville, Yancey Co. Est. $1,500 each. W. L. Craven, Raleigh, bridge engr.

Pennsylvania and **New Jersey**—DECK, etc.—Aug. 10, by Delaware River Bridge Comn., Bridge Plaza, Camden, N. J., Contr. No. 4, for 6,650 lin.ft. single track concrete deck on existing steel framework of Delaware River bridge approaches; Contr. 5, furnishing, erecting mercury-arc power rectifier equipment transformers, etc., in substation building to be constructed at Front and Race Sts., Phila., Pa. and 5th and Linden Sts., Camden, N. J. Modjeski, Masters & Chase, Architects Bldg., Phila., Pa., archts. Noted June 21.

Tex., Menard—FENCING—Menard Co., c/o H. W. Toepperwein, judge, taking bids furnishing materials and constructing 56 mi. fence on Hy. 4, 4-strand barbed wire, cedar posts, 12 ft. apart, etc. P.W.A. project.

†Va., Langley Field—TUNNEL—Aug. 30, by National Advisory Committee for Aeronautics, constructing 8 ft. high speed wind tunnel.

†T. H., Pearl Harbor—DISTRIBUTION SYSTEM—Oct. 3, by Yards & Docks, Navy Dpt., Wash., D. C., electrical distribution system for repair basin, Spec. 7604.

†Canal Zone—GAS FUELING SYSTEM—Aug. 20, by Con. Q.M., France Field, gas fueling system. $9,000.

CONTRACTS AWARDED

Calif., Los Angeles—ORNAMENTAL LIGHTING SYSTEM—City, Bd. P. Wks., City Hall, L. Andrich, city engr., ornamental lighting system in Gaffey St., from 9th St. to Paseo del Mar, to W. H. Rumble, 6507 Haas Ave., $39,994. Bids July 18, awarded July 20. Noted July 23 Daily.

Calif., San Francisco — ORNAMENTAL LIGHTING SYSTEM—Public Utilities Comn., City Hall, ornamental lighting system in 10th, Bryant, Harrison and Fell Sts., Contr. 5, Light and Power Dpt., involving 139 electroliers, complete bracket fixtures, extra conduit stubs, etc., to Union Paving Co., Call Bldg., San Francisco, $36,412. Bids July 16, awarded July 24. Noted July 19.

Calif., San Francisco—RAILWAY—Public Utilities Comn., City Hall, reconstructing Potrero St. carline from 18th to Army Sts., to A. D. Schader, 144 Spear St., $16,996 for City and County of San Francisco. Former contract rescinded.

Ill., Chicago—RADIO STATION—L. J. Weissenborn, archt., 435 North Michigan Ave., general contract 3 story, 125x150 ft. top addition, for radio broadcasting station, 435 North Michigan Ave., to R. C. Wieboldt, 1412 West Washington Blvd., for W.G.N. Radio Station, Chicago Tribune, 435 North Michigan Ave. $300,000.

Mass., Boston—STORAGE TANKS, MARINE LOADING FACILITIES, etc.—Tidewater Oil Co., 66 Locust St., Dorchester, group of 8 steel storage tanks, warehouse, garage and dock and marine loading facilities, Chelsea River, separate contracts for tanks, foundations, etc., awarded. Est. exceeds $40,000.

Mich., Muskegon—GAS PIPE LINE—American-Michigan Pipe Line Co., c/o Muskegon Gas Co., Muskegon (subsidiary American Light & Traction Co., 120 Bway., New York), constructing 50 mi. gas pipe line from Mecosta Oil fields to here, separate contracts. To exceed $500,000. Noted Mar. 1.

†Mich., Selfridge Field—ELECTRICAL UTILITY EXTENSIONS—Con. Q.M., electrical utility extensions, to Modern Electric Co., Mount Clemens, $8,068.

†Montana — ELECTRICAL DISTRIBUTION SYSTEM—U. S. Eng., Kansas City, Mo., constructing electrical distribution system for No. 7 circuit and dredge feeders, Fort Peck Dam Project; to A. S. Schulman Electric Corp., 537 South Dearborn St., Chicago, Ill., $398,478. Bids June 11. Noted June 19 Daily.

N. Y., Brooklyn—TRACKS, etc.—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, tracks and contact rail, to Cornell Contg. Co., 405 Lexington Ave., New York, $309,620. Bids July 13. Noted July 5.

N. Y., New York—SUBSTATION—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., constructing Stanton Substation for part Rapid Transit R.R., Essex St., to Skolnick Building Co., 17 East 42nd St., $94,379. Bids July 13. Noted June 28.

†N. Y., New York—DOCKS—Treas. Dpt. at office Sup. Archt., Wash., D. C., repairing dock at Quarantine Station, to T. Wetlesen, 436 Bement Ave., West Brighton, $4,650.

†O., Fairfield—UNDERGROUND DISTRIBUTION SYSTEM—Con. Q.M., Patterson Field, steam distribution system, to Wood Daum Co., 718 Carlisle Ave., Dayton, $111,800. Noted June 13 Daily.

†Washington—RAILROAD—Bureau Reclamation, Spokane, constructing 30 mi. Grand Coulee Dam construction railroad from Odair to head of Grand Coulee, to D. H. Ryan, San Diego, Calif., $235,570.

MATERIALS AND EQUIPMENT

PROPOSED WORK

FIRE TRUCK—**Madera, Calif.**—City plans purchasing fire truck. $9,000 available.

TRAFFIC BOUND SURFACE COURSE—**Moweaqua, Ill.**—Aug. 6, by Dpt. P. Wks. & Buildings, Div. Hys., furnishing materials for 24 ft. traffic bound surface course for Sect. 2-CS Moweaqua. G. H. Baker, ch. engr.

GENERATOR UNIT—**Percy, Ill.**—Syndicate Mining Co. in market for D.C. 100 kw. 250 volt direct connected steam generator unit, steam pressure about 125 lb.

CENTRIFUGAL PUMP—**St. Louis, Mo.**—Commercial Building Co., 6th and Olive Sts. in market for 2 stage centrifugal pump 5½ hp. d.c. motor about 3,000 r.p.m. to lift water 150 ft.

FUEL OIL TANKS—**St. Louis, Mo.**—Standard Oil Co. of Indiana, 314 North Jefferson Ave., applied for permit to install three 17,300 gal. tanks for fuel oil in 4017 Park Ave.

GASOLINE TANKS — **St. Louis, Mo.** — S. Buday, 3901 Lincoln Ave., applied for permit to install three 550 gal. underground tanks for gasoline, 3 pumps for automobile filling station at 3901-15 Lincoln Ave.

STORAGE TANK—**St. Louis, Mo.**—Realty Improvement Co., 1108 Colins St., applied for permit to install 12,000 gal. underground storage tank for gasoline at 1108 Colins St.

TANK—**St. Louis, Mo.**—C. Lecoutour, 4162 Flora Pl., applied for permit to install three 500 gal. underground tanks for gasoline at 1749 South Vandeventer Ave.

TANK—**St. Louis., Mo.**—Swift & Co., 3917 Papin St., applied for permit to install two 10,000 gal. underground storage tanks for gasoline at 708 South Vandeventer Ave.

UNDERGROUND TANKS—**St. Louis, Mo.**—Y. C. Ruhaack, 2623 Texas Ave., applied for permit to install three 500 gal. underground tanks for gasoline at 4723 Hampton Ave.

ELECTRICAL DISTRIBUTION SYSTEM MATERIAL—**Loyal, Okla.**—City plans purchasing material for electrical distribution system. $8,100. P.W.A. funds allotted and bonds voted.

BIDS ASKED

TRANSMISSION LINE HARDWARE, etc.—**Los Angeles, Calif.**—Aug. 15, by D. P. Nicklin, purch. agt., Dpt. Water & Power, 207 South Bway., furnishing, delivering transmission line hardware, overhead conductors, as follows: 7,750 suspension clamps, 7,500 each upper and lower arcing rings for suspension insulator strings, 200 upper arcing suspension rings, 200 lower arcing rings, suspension insulator strings, 6,350 clevis fittings for rod and 1,400 clevis fittings for plate connection for standard suspension insulators, 2,000 upper and 2,000 lower strain yokes, 2,000 upper and 2,000 lower arcing rings, strain ins. strings, 2,000 right angle double clevis fittings, strain ins. strings, 2,000 extension links strain ins. strings, 250 special arcing rings, Spec. 1462. To exceed $2,000.

GATE VALVES—**San Francisco, Calif.**—Aug. 10, by T. A. Brooks, city purch. agent, city Hall, furnishing 8, 12 and 14 in. gate valves, head gearing for 16 in. and 18 in. gate valves, 12 in. check valve, for City and County of San Francisco.

†SAND, EXPANSION JOINTS, etc.—**Fort Benning, Ga.**—Aug. 10, by Con. Q.M.: 7,700 tons sand and 14,000 tons aggregate f.o.b. Fort Benning or plant; Aug. 8, 130 catch basins, reinforcing steel expansion joints, etc., f.o.b. Fort Benning.

BRICK—**Chicago, Ill.**—Aug. 8, by Dpt. P. Wks., City Hall, 500,000 common brick, 60,000 slag brick, 100,000 colonial face brick for Cermak Pumping Station.

SHUT OFF BOXES—**Chicago, Ill.**—Aug. 9, by Dpt. P. Wks., City Hall, one thousand 2 in. shut off boxes; refined native solid asphalt and refined petroleum asphalt for Dpt. Streets and Electricity.

ROAD OIL—**Farmersville, Ill.**—Aug. 10, by Dpt. P. Wks. & Buildings, Div. Hys., furnishing, applying 8,000 gal. road oil.

†WIRE ROPE—**Vicksburg, Miss.**—Aug. 7, by U. S. Eng., P. O. Box 667, wire rope.

†RAILS—**Boulder, Nev.**—Aug. 20, by Bureau Reclamation, Denver, Colo., furnishing and delivering steel rails and miscellaneous structural steel, for installing in Boulder Power plant, Boulder Project, Arizona-California-Nevada.

CABLE—**Brooklyn, N. Y.**—Aug. 20, by Signal Supply Officer, Army Base, 58th St. and 1st Ave., 106,000 ft. cable and reels for same.

CONTACT RAIL MATERIALS—**New York, N. Y.**—Aug. 14, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., contact rail materials for Rapid Transit R.R.

BITUMINOUS OIL, etc.—**Fredericktown, Pa.**—Aug. 6, by J. Shaw, secy., Comm. East Bethlehem Twp., Fredericktown, 2,600 gal. bituminous oil and 6,500 gal. asphalt for East Bethlehem Twp., Washington Co.

LOW BIDDERS

†TURBINES—**Oregon**—U. S. Eng., Custom House, Portland, July 18, 2 Kaplan hydraulic turbines with government equipment for Bonneville Dam. Bid 1, from S. Morgan Smith Co., York, Pa., $1,193,075***Bid 2, from Pelton Water Wheel Co., 19th and Alabama Sts., San Francisco, Calif., $1,255,080***Bid 3, from Allis-Chalmers Mfg. Co., 1126 South 70th St., Milwaukee, Wis., $1,252,125.

CONTRACTS AWARDED

†DITCH CLEANING MACHINE—**Yuma, Ariz.**—Bureau Reclamation, Denver, Colo., 1 ditch cleaning machine for Yuma-Imperial Valley Canal, to Ruth Dredger Mfg. Co., 5980 Boyle St., Los Angeles, Calif., $12,400.

CRUSHED ROCK—**Los Angeles, Calif.**—City, A. J. Holm, purch. agt., City Hall, furnishing No. 3 and No. 4 crushed rock, f.o.b. bunker at Sierra, San Fernando Valley, Bid 186, to Consolidated Rock Products Co., 2730 South Alameda St., Vernon, approximately $2,000.

PIPE FITTINGS, etc.—**Oakland, Calif.**—East Bay Municipal Utility Dist., 512 16th St., c.i. pipe fittings for Orinda Filter Plant, Spec. L.S. 128, Schedules 1 and 2, to United Iron Wks., 580 2nd St., $3,662 and $3,208 respectively***Schedule 3, to Phoenix Iron Wks., 2nd and Castro Sts., $8,978***gate valves, Proposal L.S. 129, Schedules 1 and 2, to Water Works Supply Co., 501 Howard St., San Francisco, $7,760 and $3,069 respectively***250,000 gal. steel storage tank, Spec. LS-127, to Steel Tank & Pipe Co., 1100 4th St., Berkeley, $2,768. Grand total $29,445. Bids July 11, awarded July 20. Noted July 26.

POWER CRANE—**Oakland, Calif.**—East Bay Municipal Utility Dist., 512 16th St., 7 ton power crane, Proposal 549, to Spears & Wells Mchy. Co., 1832 9th St., Oakland, $5,026, less $81.50 discount. Awarded July 20.

POWER CRANE—**Oakland, Calif.**—East Bay Municipal Utility Dist., 512 16th St., one 2½ ton power crane, to Spears-Wells Mchy. Co., 1832 West 9th St., $5,720 less discount.

ROAD ROLLER—**Oakland, Calif.**—East Bay Municipal Utility Dist., 512 16th St., 1 gasoline motor driven tandem road oiler, to Spears-Wells Mchy. Co., 1832 9th St., $4,422. Awarded July 20.

TRENCHING MACHINE—**Oakland, Calif.**—East Bay Municipal Utility Dist., 512 16th St., ladder type trenching machine, to Harron, Rickard & McCone, $2,070 Bryant St., San Francisco, $8,150. Awarded July 20.

STEEL ROLLING DOORS—**Oakland, Calif.**—City Port Comn., furnishing and installing 18 steel rolling doors in Terminal Building "E", Outer Harbor, to D. A. Pancoast, 26 O'Farrell St., San Francisco, $2,938. Bids July 16, awarded July 24.

†Federal Government.

Materials & Equipment (Continued)

RAILWAY TRACK CROSSINGS—**San Francisco, Calif.**—T. A. Brooks, city purch. agent, City Hall, furnishing steel track crossings for Municipal Railway System, Bid 1220, involving 1 solid manganese steel single over double track railway crossing, and 1 solid manganese steel single electric over single cable track crossing, to Columbia Steel Co., Russ Bldg., $2,908 and $1,260 respectively***1 solid manganese steel, single over double track railway crossing to Pacific Coast Steel Corp., 20th and Illinois Sts., $2,038. Grand total $6,206. Bids June 22, awarded July 23.

CRUSHED LIMESTONE—**Chicago, Ill.**—City, crushed limestone for Dpt. Streets & Electricity, during term ending Dec. 31, 1934, to Material Service Corp., 33 North LaSalle St., $223,500. Bids Apr. 23. Noted Apr. 19.

PLATES—**Chicago, Ill.**—City, etched brass license plates and badges and metal license plates, to C. H. Hanson Co., 303 West Erie St., Chicago, $1,493 and $1,023 respectively. Bids July 18. Noted July 12.

STONE RIP RAPPING—**Dennis, Mass.**—Commonwealth of Massachusetts, Dpt. P. Wks., F. E. Lyman, comr., 100 Nashua St., Boston, furnishing 725 tons stone rip rap along shore near Taunton Ave., to Thos. Whalen & Sons, Inc., Whitman, $1,755. Bids July 17, awarded July 21.

GENERATING EQUIPMENT, etc.—**Medfield, Mass.**—Commonwealth of Massachusetts, Dpt. Mental Diseases, Boston, generating equipment and switchboard, to G. and N. Eng. Co., 252 Dover St., Boston, $29,979***2 boilers, to Erie City Iron Wks., 25 Huntington Ave., Boston, $10,400***2 stokers, to Flynn & Emrick Co., 142 Berkeley St., Boston, $4,215. Grand total $44,594. **P.W.A.** Bids July 17.

†SEWAGE PUMPS—**Selfridge Field, Mich.**—Con. Q.M., installing sewage pumps and equipment, to E. B. Reid, 8817 Madison Ave., Detroit, $2,500. Bids July 14.

†PORTLAND CEMENT—**Duluth, Minn.**—U. S. Eng., Canal Park, 1,000 sacks portland cement for East Breakwater repairs, Two Harbors, to Two Harbors Lumber Co., Two Harbors, at 70c. per sack, total $700. Bids July 23.

†PONTOON PIPE—**Vicksburg, Miss.**—U. S. Eng., 65 sections steel pontoon pipe, to Midland Barge Co., Midland, Pa., $28,700. Bids June 12. Noted June 7.

RAIL TIES—**New York, N. Y.**—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., treated ties, to Eppinger & Russell, 80 8th Ave., $145,531. Bids July 17. Noted July 5.

PIPE—**Portsmouth, O.**—City Manager, involving 8,000 ft. 8- to 16-in. c.i. pipe waterworks, to Glamorgan & Co., Lynchburg, Va., $9,614.

IRON CASTINGS—**Providence, R. I.**—City, Bd. Contr. & Supply, City Hall, furnishing iron castings for sewer construction projects, to Grinnell Co., Inc., 260 Exchange St., $2,030. Awarded July 24.

BITUMINOUS MATERIALS—**Cornwall, Ont.**—Stormont-Dundas and Glengarry Counties, supplying bituminous materials for roads, to Colas Roads Ltd., 21 Dundas St., Toronto. Est. $15,000. Awarded July 16. J. G. Cameron, Cornwall, engr. Noted Mar. 22.

FOREIGN

Australia—New South Wales Government, **Sydney,** bids in summer for constructing national library $500,000, and coast hospital $750,000*****Brighton** Municipal Council receives bids in August, constructing bathing pool $100,000*****Wangaratta** Municipal Council bids before Sept. 1, sewage works $325,000*** Queensland Government, **Brisbane,** voted $15,000,000 erecting bridge over Brisbane River and control of river flood prevention, water conservation scheme and sewerage scheme.

Australia, Melbourne—Sept. 4, by Deputy Minister Ports & Telegraph Dpt., supplying telephone switchboard plugs and sleeves and vitreous resistances of various value.

England—Sheffield City Electrical Engineer preparing plans Neepsaid Electricity Generator Station, $2,110,000 and addition to Blackburn Meadows Station, $2,195,000*****Walton** Rural Council, voted $237,500 for water scheme, bids in August******Wallasey** Town Engineer soon takes bids sea front promonade extension, $2,567,000***Aug. 13, by Urban Dist. Council, Salcombe, constructing 300 m.g. reservoir, Lemon & Blizard, 24 Lockeyer St., Plymouth, engrs.***Aug. 20, by Central Electrical Bd., **London,** supplying and erecting 66,000 volt station***Aug. 20, by John Taylor & Son, Caxton House, Westminster, London, supplying, erecting 7 sets electrically driven, vertical unchokable centrifugal sewer pumps, 1 centrifugal borehole pump, complete with motor, automatic starters, pipes and valves, for **Worthing.**

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England—Durham City Council takes bids in summer hospital $400,000*****Blackpool** Town Council takes bids in summer town hall $3,750,000*****Beckanshan** Educ. Com. takes bids in summer school $107,800*****Slough** Educ. Comn. takes bids in summer school $160,000*****Eton** Educ. Com. takes bids in summer school $155,000*****Wallington** Educ. Com. takes bids in summer school $198,350*** Hoptan & Sons, Union Wks., Market Harbro, **Leicester,** in the market for standing timber (hardwood) in large quantities***Controller Post Office Stores, Dpt. 19, Bedford St., **London,** bids in August, supplying Scotts pine telegraph poles, to be felled during winter of 1934-35 and delivered during following summer***Taylor & Low Brothers, Inc., Canada Wharf, **Bristol,** in the market large quantities of hardwood lumber, also larch***J. W. Telford, Guildhall Chambers, Sandhill, in the market timber, hardwood and softwoods, **Newcastle-Upon-Tyne***** D. Kitching & Sons, Ltd., **Knaresboro,** in market for timber sports and planking ash*** **Hemsworth** Rural Council bids in August houses $320,000*****Barnsley** Town Council bids in August houses $240,000***R. Lancaster & Sons, **Turkenham,** bids in August 232 houses $351,200***C. H. Smith, **Kenilworth,** bids in August 123 houses $196,800.

Irish Free State, Dublin—S. T. O'Kelly, minister of Local Government bids in summer for 71 new hospitals, incl. 23 county hospitals, 28 district hospitals and 20 hospitals for infectious diseases.

Italy, Bergamo—Romeno Bottazzi, Figli, Bergamo, Italy, plans alcohol and chemical plant. Project approved by Italian government.

Italy, Milan—Societe Nazionale Chimica, Milan, plans nitric acid and fertilizer ammonium nitrate plant. Est. about $500,000.

Japan, Kobe—R. Murayama & Co., 37, Sakaemachi, 3 chome, Kobe, in market for supply of ribbon steel; specifications 1 mm to 1.5mm thickness, unhardened and without holes. Custom duty 10% ad valorem.

New Zealand, Wellington—Sept. 11, by Director General Stores Div., General Post Office, 40 mi. wire, jumper flame proof***Sept. 12, for 100 tons wire, tinned, annealed copper 11.044 in. vulcanized india rubber, insulated taped and braided, twisted pair and 30 mi. wire, tinned annealed copper 1/.036 vulcanized india rubber, insulated taped and braided twisted pair; supplying 40 mi. bronze insulated and braided wire***Sept. 17, 1 ton wire, bronze, 150 lb. per mi., 5 tons wire, copper binding, 60 lb. per min., 5 tons wire, copper binding 50 lb. per mi.***Sept. 18, 5,000 bolts arm double enclosed***Sept. 25, 3,000 pole steps galvanized steel.

Scotland, Glasgow — Chilian & Colonial Agencies, Ltd., Hope St., in market supply sulphate of ammonia (Neutral grade) 1,000 tons August shipment, 1,000 tons October shipment and 1,000 tons January shipment. Custom duty 20%.

Scotland, Glasgow—Motherwell Brick Co. Ltd., 29 St. Vincent Pl., Wallison, genl. mgr., plans brick plant.

South Africa—Government **Table Bay,** voted $600,000 for widening south dam of docks; $2,767,500 for additional deep water berths; and $1,375,000 for precooling plant at docks ***South African Iron and Steel Industrial Corp., **Pretoria,** bids in summer for erecting and equipment for foundry $350,000; sheet metal plant 35,000 tons capacity per year $2,500,000 ***South African Railway & Harbor Administration, **Johannesburg,** ten 4 ton electrically driven portal gib cranes of crank level luffing type, to Storthert & Ritt, Bath, England.

Union Soviet Socialist Republics—Soviet Government, Moscow, or c/o Amtorg Trading Corp., 261 5th Ave., New York, neurological sanatorium, day labor. $500,000 or more.

U.S.S.R., Astrakhan — Glavriba (State Fish Trust) Soviet Government, Moscow, or c/o Amtorg Trading Corp., 261 5th Ave., New York, fish packing and distribution plant, by day labor. $500,000 or more.

Union Soviet Socialist Republics—Railroad Trust, Soviet Government, Moscow, or c/o Amtorg Trading Co., 261 5th Ave., New York, constructing new railroad from Akmolinsk to Kartaly, day labor. To exceed $5,000,000.

Union Socialist Soviet Republics—Soviet Government, Moscow, or c/o Amtorg Trading Corp., 261 5th Ave., **New** York, plans constructing 2 seaports on Caspian Sea. To exceed $1,000,000.

U. S. S. R., Barnaul—Barnaul Textile Combine, Soviet Government, Moscow, or c/o Amtorg Trading Co., 261 5th Ave., **New York,** cotton textile plant. $500,000 or more.

PUBLIC BUILDINGS

PROPOSED WORK

†Ark., Russellville—Coast & Geodetic Survey plans watch tower and observation post to be used as laboratory, at Mount Nebo Point.

†Calif., Alhambra—Treas. Dpt. at office Sup. Archt., Wash., D. C., rejected bids Apr. [illegible] U. S. Post Office. Will readvertise. Noted Mar. [illegible]

Calif., Bakersfield — Kern Co. Union High School Dist., election Sept. 14, $300,000 for union high school and auditorium. P.W.A. recently allotted $300,000 for same. C. H. Biggar, Haberfelde Bldg., archt. Noted July 19.

Calif., Daly City—Daly City Grammar School Dist., W. J. Sweeney, clk., sketches by A. F. Roller, Crocker 1st Natl. Bank Bldg., San Francisco, additions to Crocker Elementary, Jefferson Elementary and Woodrow Wilson Elementary Schools. $35,000 each. $105,000 allotted by P.W.A. Bond election is contemplated to secure loan.

Calif., Los Angeles—Los Angeles Co. submitted plans to Bd. Supervs. for three 1 story units and connecting arcades for Blocks C, D and E, Los Angeles County Farm, Rancho Los Amigos, incl. extension to steam lines, water lines, sewer lines and electric services and circuits, rein.-con. buildings, etc. $133,7[illegible] W. Davidson, Hall of Records Bldg., mechanical engr.

Calif., Placentia—Placentia Union High School Dist., election Aug. 10, $200,000 for high school. T. C. Kistner, 814 Architects Bldg., Los Angeles, archts. Noted July 5.

Calif., Riverside—Supervs. Riverside Co. considering plan to apply for S.E.R.A. aid in financing new 3 or 4 story, steel frame county hospital. $271,000-$311,000. G. Stanley Wilson, Riverside, archt.

†Ill., Herrin—Treas. Dpt. at office Sup. Archt., Wash., D. C., soon takes bids rein.-con. brick, stone post office. $100,000.

Ill., Jacksonville—Dpt. P. Wks. & Buildings, Div. Architecture, Springfield, plans by C. H. Hammond, state superv. archt., Capitol Bldg., Springfield, 2 dormitories, $185,000 of which $55,000 grant allotted by P.W.A.; also additional P.W.A. grant of $26,400 is to be asked for school wing, incl. power house addition and stack, total cost $88,000, at Illinois State School for Deaf. Noted Apr. 12.

Ill., Joliet—Dpt. P. Wks. & Buildings, Div. Hys., Springfield, plans by C. H. Hammond, state superv. archt., Capitol Bldg., Springfield, prison addition, incl. dining hall and kitchen, Statesville Prison. To exceed $1,000,000.

†Ill., Joliet—U. S. Eng., Post Office Bldg., Chicago, making plans 1 story, brick pattern shop, at Government Landing.

Ill., Stateville—Dpt. P. Wks. & Buildings, Div. Hys., Springfield, sketches made by C. H. Hammond, superv. archt., Capitol Bldg., Springfield, new prison.

†Ill., Watseka—Treas. Dpt. at office Sup. Archt., Wash., D. C., soon takes bids rein.-con., brick, stone post office. $66,000 appropriated by P.W.A.

†Ind., Aurora — Treas. Dpt. at office Sup. Archt., Wash., D. C., making plans post office.

Ia., Ames—Independent School Dist., F. B. Howell, secy., plans by Tinsley, McBroom & Higgins, Hubbell Bldg., Des Moines, Junior High School, 2 story, basement, 5th and Clark Sts. $250,000. $59,000 grant allotted by P.W.A. May hold bond election in September.

Ia., Ames—Bd. Educ. soon takes bids rein.-con., brick, stone school. $159,000 allotted by P.W.A. Tinsley, McBroom & Higgins, 702 Hubbell Bldg., Des Moines, archts., Noted July 27.

Ia., Decorah—Bd. Educ. soon takes bids rein.-con., brick, stone school. $125,000 allotted by P.W.A.

La., Edgard—City plans 1 story, brick courthouse. P.W.A. approved $150,000 loan and grant. A. S. Montz, 740 Poydras St., New Orleans, archt. Noted Mar. 22.

La., New Orleans—City plans by Sam Stone, Jr. and Co., Masonic Temple, new French Market and Farmers Market. $600,000. P.W.A. allotted $240,000 loan.

†Md., Annapolis—Yards & Docks, Navy Dpt., Wash., D. C., making plans officers quarters, barracks, repair shop, storage building, and altering Isherwood Hall, at U. S. Navy Academy. $300,000. **Maturity this fall.**

Md., Cumberland—City making plans municipal light plant. Burns & McDonnell Eng. Co., 107 West Linwood Blvd., Kansas City, Mo. Engrs. Noted Mar. 22.

†Mass., Danvers—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans 1 story, brick, stone post office. $84,000 funds appropriated.

†Federal Government.

Public Buildings (Continued)

Mass., Gardner—City, J. A. Tempany, City Hall, soon takes bids brick, stone city hall, Pleasant St. $185,000. P.W.A. Project 5506. Federal grant approved July 22. W. G. Upham, 700 Washington St., Norwood, archt. Noted Feb. 8.

†Mass., Great Barrington—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans 1 story, basement, brick, stone post office. $82,000 funds appropriated.

Mass., Milford—Town, A. O. Caswell, supt., plans by R. A. Cook & W. T. Phillips, 57 Prospect St., brick, steel high school, Spruce and School Sts. $250,000. P.W.A. project. Noted Nov. 2.

Minn., St. Cloud—City plans municipal power plant. P.W.A. funds allotted. $1,250,000. Burns & McDonnell Eng. Co., 107 West Linwood Blvd., Kansas City, Mo., engrs. Noted Jan. 18.

Mo., Kansas City—Jackson Co. plans completed by A. H. Gentry, Voskamp & Neville, 4 West 13th St., plans Leeds Hospital addition. $110,000. E. Pfuhl, Fairfax Bldg., engr..

Mo., Moberly—City defeated $566,000 bonds for municipal power and light plant. $134,000 grant allotted by P.W.A. Noted July 12.

Mo., St. Louis—Bd. P. Service, City Hall, plans additions to eleemosynary institutions, incl. children's building at Robert Koch Hospital, Koch; dining halls, physicians quarters and negros' building, $1,750,000; new clinic building, children's building, reconstructing laundry building at City Hospital 1 $1,500,000; administration and 6 dormitory buildings at St. Louis Training School for Feeble Minded, $1,520,000; remodeling present buildings at City Infirmary $800,000; 2 new buildings and enlarging present buildings at Isolation Hospital $800,000; psychopathic hospital $750,000. Total $8,730,000. $2,522,000 allotted by P.W.A. Noted Dec. 21.

Mo., Trenton—City bids in August, diesel engine, power plant. $315,000. P.W.A. project. Burns & McDonnell Eng. Co., 107 Linwood Blvd., Kansas City, engrs. Noted Dec. 14.

†N. H., Newport—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans 1 story, basement, brick, stone post office, concrete found. $80,000 funds appropriated.

†N. H., Plymouth—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans 1 story, basement, brick, stone post office, concrete found. $78,000 funds appropriated.

N. J., Fort Lee—Bd. Educ. election in September, for school. $400,000. P.W.A. project. Hacker & Hacker, Main St., archts.

N. Y., Castile—Bd. Educ. plans by Bley & Lyman, 505 Delaware Ave., Buffalo, school addition. Est. about $105,000. P.W.A. allotted $85,000 toward project. Noted Mar. 22.

N. Y., Guilderland—Bd. Educ. plans by J. W. Montross, Clinton St., Schenectady and soon takes bids school. Est. about $105,000. $20,000 allotted by F.W.A.

N. Y., Guilford—Bd. Educ. plans R. A. Freeburg, 1105 West 3rd St., Jamestown, for Mt. Upton School. Est. about $105,000. $81,000 allotted by P.W.A. **Maturity soon.**

N. Y., Gilbertville—Bd. Educ., Town of Butternuts, plans by R. A. Freeburg, 1105 West 3rd St., Jamestown, school. $137,000. P.W.A. allotted funds. Noted Apr. 5.

N. Y., Hempstead—Bd. Educ. plans by Knappe & Morris, 192 Lexington Ave., New York, Seaford School. $167,200. **Maturity soon.** P.W.A. funds allotted. Noted June 28.

N. Y., Hempstead—Bd. Educ. plans by W. H. Spaulding, 163 Jamaica Ave., Jamaica, repairing Merrick School. P.W.A. allotted $185,000 funds. Noted Apr. 12.

N. Y., Hunter—Bd. Educ. plans school. To exceed $100,000. P.W.A. funds allotted. R. A. Graham, Middletown, archt. Noted Apr. 12.

N. Y., Machias—Bd. Educ. plans by Bley & Lyman, 505 Delaware Ave., Buffalo, school addition. Est. about $105,000. $72,000 allotted by P.W.A. Noted Feb. 1.

N. Y., Malverne—Bd. Educ. plans by F. P. Wiedersum, 240 Rockaway Ave., Valley Stream, school. $251,800. Noted Mar. 29.

N. Y., New York—Langdon W. Post, chn., New York Housing Authority, has named 22 architects or firms who have qualified in the recent competition with designs for low cost housing: Holmgren & Volz, 371 Fulton St., and S. Gardstein, 50 Court St., both Brooklyn; H. Ginsbern, 205 East 42nd St.; P. Trapani, 762 South Oak Dr.; E. T. See and W. T. McCarthy, 21 West 45th St.; F. J. Forster and R. H. Jones, 500 5th Ave.; B. C. Turner, 49 East 49th St.; E. A. Dennison, 40 East 49th St.; C. F. Fuller, 485 Madison Ave.; G. H. Gurney, 420 Madison Ave.; H. L. Walker, 144 East 30th St.; D. L. Roth and Associates, 34 West 75th St.; W. J. Hohauser, 1841 Bway., W. R. Amon, 607 5th Ave.; C. S. Stein, 56 West 46th St.; E. J. Robin and S. Braverman, 415 Lexington Ave.; DeYoung & Moscowitz, 205 East 42nd St.; Peabody, Wilson & Brown, 140 East 39th St.; J. W. Ingle, 501 5th Ave.; W. F. Domenick, 522 5th Ave.; Morris & O'Connor, 101 Park Ave.; A. E. Poor, 101 Park Ave.; E. D. Litchfield, 578 Madison Ave.

N. Y., New York—Bd. Educ., 500 Park Ave., New York, plans by W. C. Martin, Flatbush Ave. extension and Concord St., Brooklyn, new plumbing, etc., in P.S. 115, 62 Audubon Ave. $15,000; in P.S. 2, 8 Henry St. $28,000; and in P.S. 203, Rivington St. $30,000.

N. Y., Remsen—Bd. Educ. plans by Bagg & Newkirk, Gas & Electric Bldg., Utica, school $196,000 allotted by P.W.A. **Maturity soon.** Noted Oct. 12.

N. Y., Seneca Falls—Bd. Educ. plans by H. O. Fullerton, 111 State St., Albany, school. Est. about $105,000. $20,500 grant allotted by P.W.A. **Maturity soon.**

N. Y., South Glens Falls—Bd. Educ., Moreau, plans by M. L. Crandell, 200 Glen St., Glens Falls, school, here. $200,000. P.W.A. funds allotted. Noted Mar. 22.

N. Y., Tannersville—Town of Jewett Bd. Educ. plans by R. A. Graham, Middletown, school. To exceed $105,000. Funds allotted by P.W.A. Noted Apr. 12.

†N. Y., Wellsville—David A. Howe Memorial Library, J. F. Brown, chn., Bd. Trustees, plans 2 story library building. $300,000. **Maturity in 1935.**

Features of Daily Service

The McGraw-Hill Construction Daily offers these features: Daily reports on Proposed Work, Bids Asked, Low Bidders and Contracts Awarded. Daily summary of volume of contracts awarded by classes of work. Weekly summaries of Bond Elections and Bond Sales.

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N. Y., Wilson—Bd. Educ. plans by C. R. Phelps, Gluck Bldg., Niagara Falls, school $220,000. P.W.A. funds allotted. Noted Mar. 29.

†N. C., Cape Hatteras — U. S. Lighthouse Service, Wash., D. C., plans new lighthouse 1 mi. inland, in Atlantic Ocean.

N. C., Goldsboro—State Hospital for Colored Insane, plans constructing new building for tubercular patients, addition to criminal building, boiler house, $28,231; general repairs to other buildings, $9,000. Cost of all work not available, but will exceed $105,000. G. Woodard, Wilson, chn. of Board.

O., Cincinnati—At office Hamilton Co. Tuberculosis Hospital Building Comn., 202 Hamilton Co. Court House, plans nearing completion by H. Hake, 2400 Gilbert Ave. and S. Hannaford & Sons, 1024 Dixie Terminal Bldg., assoc. archts., 1 story, basement, brick, stucco, occupational therapy and auditorium building, plain found., Guerley Rd. $175,000. P.W.A. grant made. Noted June 15, 1933.

O., Fremont—Bd. Comrs., Sandusky Co., election Aug. 14, $275,000, for new court house.

†Okla., Anadarko—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans post office. $180,000. P.W.A. funds allotted.

†Okla., Elk City—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans post office. $80,000. P.W.A. allotted funds.

†Okla., Henryetta—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. $80,000. P.W.A. funds allotted.

†Okla., Hugo — Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. $65,000. P.W.A. allotted funds.

†Okla., Claremore—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans constructing U. S. Post Office. $68,000. P.W.A. allotted funds.

†Okla., Pauls Valley—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. $66,000. P.W.A. allotted funds.

†Okla., Wewoka—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans U. S. Post Office. $89,000. P.W.A. allotted funds.

Pa., Phila.—City plans by Dpt. City Architecture, J. P. Sinkler, dir., City Hall Annex, constructing 5 hospital buildings for hospital for mental diseases, Roosevelt Blvd. $300,000. Noted June 22, 1933.

Tex., Colorado—City preliminary surveys municipal light and power plant. $257,000.

†Tex., Fort Sam Houston—Con. Q.M., improving army post, incl. theatre, large warehouse, at Duncan Field. $1,100,000.

Tex., Port Arthur—Jefferson Co., c/o B. B. Johnson, judge, revised plans by F. C. Stone, Goodhue Bldg., Beaumont, and C. L. Wingall, 915 4th St., sub-office and jail. $173,000. Noted Nov. 30.

Tex., San Antonio—Bd. State Hospital, South Presa St., rejected bids July 23, 2 story, brick, rein.-con. psychopathic building, incl. furnishings, etc., for women of the institution. Est. $110,000.

†Vt., St. Albans—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans 3 story, brick, stone, granite post office and custom house. $250,000 funds appropriated.

Wash., Seattle—Bd. Regents, University of Washington, plans by J. Graham, Dexter Horton Bldg., dormitory $600,000, infirmary $200,000, and power house $142,000. Total cost $950,000. $687,500 allotted by P.W.A. Noted Dec. 14.

BIDS ASKED

†Calif., Roseville—Aug. 22, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office.

†Ind., Hartford City—Aug. 14, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. Noted Sept. 21, 1933.

Ia., Pomeroy—Pomeroy Public Schools, F. E. Hoger, secy., bids about Aug. 21, 2 story, 109x138 ft., brick, concrete school. $70,000. $21,000 allotted by P.W.A. Dougher, Rich & Woodburn, 310 Old Colony Bldg., Des Moines, archts.

Md., Baltimore—Aug. 8, by Bd. Awards, plumbing and gas fitting, heating and ventilating and electric wiring and fixtures, School 97, Jackson Pl. and Fairmount Ave., for Dpt. Educ., 3 East 25th St.

Mass., Boston—Aug. 22, by Trustees Boston City Hospital, erecting and completing surgical operating and ward building, Harrison Ave. P.W.A. project. James H. Ritchie & Associates, 100 Arlington St., archts. Noted Feb. 8.

†Mass., Dedham—Aug. 15, by Treas. Dpt. at office Sup. Archt., Wash., D. C., 1 story, basement, brick, steel, post office, High St. and Maple Pl. $52,300. Noted Mar. 16.

Mass., West Springfield—Town, Superintendent Schools, 126 Park Ave., taking bids 3 story, 60x125 ft., brick, steel school, Park Ave. $105,000. McClintock & Craig, 458 Bridge St., Springfield, archts.

Mass., Worcester — Belmont Hospital, City, Mayor's Office, taking bids 2½ story, rein.-con. ward at Belmont Hospital. $300,000. Fuller & Delano, 44 Front St., archts.

†Mo., Kansas City—Aug. 15, by Treas. Dpt. at office Sup. Archt., Wash., D. C., miscellaneous changes in U. S. Post Office.

Mo., St. Louis—Aug. 21, by Bd. P. Service, City Hall, two 4 story, basement, 40x56 ft., 2 tiers for solaria at City Sanatarium, Arsenal St. $102,300. P.W.A. project. A. Osburg, City Hall, archt., W. C. E. Becker, city engr. Noted July 26.

†Neb., Omaha—Aug. 15, by Treas. Dpt. at office Sup. Archt., Wash., D. C., miscellaneous changes in federal office building.

N. J., Trenton—Aug. 13, by State Hy. Dpt., Trenton, constructing laboratory building at Fernwood. H. A. Kelly, 921 Bergen Ave., Jersey City, engr. Bids July 21 rejected. Noted July 12.

N. Y., New York—Aug. 9, by W. F. Morgan, Jr., Comr. Public Markets, heating and ventilating system for 48 merchants' stores, restaurant building, and comfort station at Bronx Municipal Market, Exterior and East 150th Sts.

†O., Circleville—Aug. 15, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. Noted Feb. 9, 1933.

†O., London—Aug. 9, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. Noted June 7.

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†*Federal Government.*

Public Buildings (Continued)

O., Oxford—Aug. 22, by State Dir. P. Wks., 3 story, basement, brick, steel, rein.-con. additions and alterations to Freshman Dormitory, plain found., for Miami University. Harsh & Davies, 145 North High St., Columbus, archts. Fosdick & Hilmer, Union Trust Bldg., Cincinnati, engrs. Noted $190,000 P.W.A. project. Noted Oct. 12.

Pa., Reading—Aug. 14, by Reading School Dist., 8th and Washington Sts., 2 story, basement, 60x200 ft. and 100x110 ft., brick, steel, rein.-con. Amanda Stoudt School, plain found., 10th St. To exceed $200,000. Associated Architects, 147 North 5th St., archts.

†Va., Norfolk—Aug. 22, by Yards & Docks, Navy Dpt., Wash., D. C., extending building at Navy Yard, Spec. 7748.

†C. Z., Summit—Aug. 29 (extended date), by Yards & Docks, Navy Dpt., Wash., D. C., constructing buildings, Spec. 7515. Noted June 28.

CONTRACTS AWARDED

Calif., Visalia—Supervs. Tulare Co., constructing courthouse, to F. J. Reilly, 6350 Fulton St., San Francisco, $125,721. **P.W.A.** awarded July 17.

†D. C., Wash.—National Park Service, reconstructing executive offices, to N. P. Severin Co., 222 West Adams St., Chicago, Ill., $318,575.

†D. C., Wash.—Dpt. Interior, constructing building and dismantling and removing engine for power plant at Howard University, to Bahen & Wright, 916 Rhode Island Ave. N.E., $195,440 and $1,000 respectively***turbo-generators, motor generators and exciters, to Industrial Power Equipment Co., 421 West Camden St., Baltimore, Md., $54,400***piping, to M. H. Pagenhardt Co., 400 Central Ave. N.W., $67,738 ***chimney, to Alphonse Custodis Chimney Co., Bennett Bldg., New York, N. Y., $9,790*** electrical work and switchboard, to Jandous Electric Equipment Co., 210 East 40th St., New York, $53,950. Grand total $382,318. Bids May 22.

Del., Richardson Park—H. C. Conrad, High School Building Comr., general contract 2 story, basement, steel, high school, Boxwood Rd., near here, to Al. Lauritsen Co., 1710 Lovering St., Wilmington, $231,922***plumbing, to Hadley Contg. & Constr. Co., Fox Bldg., Phila., Pa., $17,570***heating and ventilating to Raisler Heating Co., 129 Amsterdam Ave., New York, $47,865***electrical work, to McHugh Electric Co., 211 West 8th St., Wilmington, $26,488. Grand total $323,845.

Ia., Atlantic—Cass Co., J. M. Ward, aud., general contract brick, stone court house, to C. C. Larson, Council Bluffs, $98,297***plumbing and heating, to H. F. Enenbach, Harland, $16,751***electrical work, to H. C. Metcalf, Anamosa, $2,550. Grand total $117,598. **P.W.A.** Noted Aug. 24.

Ia., Des Moines—City, general contract armory, to A. H. Neumann & Bros., 519 Hubbell Bldg., $183,986***heating and plumbing, to Van Dyke Heating & Plumbing Co., 929 6th St., $22,753 ***electrical work, to Furlong Electric Co., 907 Walnut St., $5,099. Grand total $211,838. **P.W.A.** Tinsley, McBroom & Higgins, 702 Hubbell Bldg., archts.

†Mass., Cambridge—Treas. Dpt. at office Sup. Archt., Wash., D. C., 2 electric freight elevators, to Portland Elevator Co., 133 Oliver St., Boston, $5,930. Bids July 10. Noted July 5.

Mass., New Bedford—City, City Property Comn., City Hall, structural steel for 3 story, basement, 155x160 ft. high school, to John E. Cox Co., Inc., 753 Davol St., Fall River*** light iron, to Hub Steel & Iron Wks., 43 Freemont St., Somerville***marble tile, terrazzo and slate, to Capitol Marble & Tile Co., Inc., 48 Oxford St. Noted June 14, under "Contracts Awarded."

Mass., Newtonville—J. Slotnik Co., general contractors, 38 Newbury St., Boston, electrical work for 2 story, basement elementary school, Linwood Ave. and Nevada St., to Hawes Electric Co., 15 Main St., Watertown***heating, to Cleghorn Co., 89 Broad St., Boston***plumbing, to R. H. James & Co., 120 Milk St., Boston, for City of Newton, H. A. Hageman, P. Buildings Comr. **P.W.A.** Awarded July 19.

Mass., Norfolk—Thos. O'Connor & Co., general contractors, 238 Main St., Cambridge, plumbing for service building and hospital, Pondville State Hospital, for Commonwealth of Massachusetts, Dept. Health, State House, Boston, to J. C. Keenan, 5 Russell Park, Malden; heating to J. J. Hurley & Co., 104 Bway., Boston. Awarded July 20. **P.W.A.** Noted July 19, under "Contracts Awarded."

Mo., Columbia—Bd. Educ., Columbia School Dist., to J. Epple Constr. Co., Columbia, general contract, Robert E. Lee School, 2 story, basement, 70x138 ft., rein.-con., brick, $67,597; 2 story, 50x50 ft. addition to Jefferson Junior High School, $72,065; 2 story, 50x60 ft. addition to Fred Douglas School, $19,045***to J. L. Crum, Columbia, heating in Jefferson Junior High School addition, $6,025; heating Fred Douglas School, $6,200***to P. Groeschel, Marshall, heating Robert E. Lee School, $9,357*** to J. E. Hathman, Columbia, general contract John Ridgeway School addition, $42,818***to E. K. Campbell Heating Co., 4485 Olive St., St. Louis, heating in same school, $4,054. Grand total $227,161. Bids July 17. Noted July 5.

Mo., Gardenville—Bayless Consolidated School Dist. St. Louis Co., O. C. Gestring, secy., Weber Rd. and Hidlesheim Ave., 2 story, basement, 61x111 ft. school, to Kellermann Contg. Co., 625 North Euclid Ave., St. Louis, $94,850*** electrical work, to Gamp Electric Co., 3614 Delmar Blvd., St. Louis, $4,665***plumbing, to Sam Burman & Co., 4659 Page Blvd., St. Louis, $9,668***heating, to Koppen-Smith Heating Co., 2628 Olive St., St. Louis, $11,371. Grand total $120,566. General contractor awarded contract for rubble stone, to N. Grbeich, 4753 Oldenberg St.; cut stone, to Pickel Stone Co., 1320 South Vanderventer Ave.; brick work and tile partitions, to Reinschmidt Bricklaying Co., 1615 Prather St.; sheet metal work, to Lucas Sheet Metal & Furnace Co., 6255 St. Louis Ave.; terrazzo, to Missouri Terrazzo Co.; plastering, to Dunn & Campbell, 119 North 7th St.; painting, to A. Koedding Co., 5611 Wabada St.; glass and glazing, to Pittsburgh Plate Glass Co., 3900 Chouteau Ave.; marble, to Shaw Marble & Tile Co., 4177 Meramec St.; mastic flooring and slate blackboards, to G. Caine, Chemical Bldg.; slate roofing, to South St. Louis Slate & Tile Roofing Co., 6147 Manchester Ave.; caulking and bronze thresholds, to Moslank Metal Weatherstrip Co., 4158 Delmar Blvd. **P.W.A.**

†Mo., Hannibal—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to A. Smith & Co., 100 North La Salle St., Chicago, Ill., $78,940. Bids July 3. Noted June 21.

Mass., Northampton—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, electrical work at State Hospital, to Barnes-Pope Co., 98 Brookline Ave., Boston, $22,989***piping, to Holyoke Valve & Hydrant Co., 150 Race St., Holyoke, $105,624***boiler settings, to D. L. MacFarlane, 203 Jefferson St., Dedham, $21,104. Grand total $149,717. **P.W.A.** Bids July 17. Noted July 12.

†N. Y., Binghamton—Treas. Dpt. at office Sup. Archt., Wash., D. C., elevator plant, to General Elevator Co., Bush St. and Ridgley Ave., Baltimore, Md., $23,128. Bids June 25.

N. Y., Ithaca—State Dpt. Health, State Office Bldg., Albany, general contract tuberculosis hospital for Biggs Memorial Hy., to Wills, Taylor & Mafera, 101 Park Ave., New York, $397,397. Bids June 5. Noted May 2.

N. Y., Jamaica — Bd. Transportation, 250 Hudson St., New York, inspection shed at Jamaica Yard, to W. Kennedy Constr. Co., 215 Montague St., Brooklyn, $534,000. Bids July 20. Noted July 5.

N. Y., Jamestown—J. W. Cowper Co., general contractors, Rand Bldg., Buffalo, structural steel and steel joists incl. erection for school, to McClintic-Marshall Corp., Bell and Abbey Sts., Buffalo, for Bd. Educ., 4th and Pine Sts. **P.W.A.** Noted July 19 under "Contracts Awarded."

N. Y., Rochester—Hunkin-Conkey Co., general contractors, 1740 West 12th St., Cleveland, O., structural steel, incl. erection, for Rundell Memorial Library, to Heughes Steel Co., 1029 Lyell Ave., for City. Noted June 21, under "Contracts Awarded."

N. Y., Saratoga Springs—Saratoga Springs Authority, Spring St., plumbing for 2 bathhouses, to Raisler Heating Co., 129 Amsterdam Ave., New York, $79,400***electrical work, to E. G. May, 50 Central Ave., Albany, $20,350 ***elevators, to Burwak Co., 227 Fulton St., New York, $9,442. Grand total $109,192. Heating, to E. W. Tompkins, 22 Market St., Albany. Bids May 4. Noted Apr. 12.

N. Y., Saratoga Springs—Saratoga Springs Authority, sanitarium, to J. J. Turner & Sons, 120 Guy Park Ave., Amsterdam, $298,181. Bids June 29, awarded July 17. Noted June 14.

N. Y., Utica—Bd. Educ., 13 Elizabeth St., Utica, excavation for school, Hilton Ave., to Leaf Bros. & Owens, Herkimer, $8,410***concrete found., fittings, floor construction, stone and brick settings, to Bedford Constr. Co., 1300 Broad St., $186,089***furnishing, and erecting steel, to McClintic Marshall Corp., Oliver Bldg., Pittsburgh, Pa., $46,725***limestone, to Monon Stone Co., Bloomington, Ind., $26,292***granite to General Stone Co., 10 Buell Rd., Rochester, $1,121. Grand total $268,637. Bids July 24.

O., Hamilton—City, R. P. Price, city mgr., general contract city hall, brick, rein.-con., Indiana limestone or Ohio sandstone facing, Monument St., to Boyajohn & Barr, 299 South Front St., Columbus, $358,729***plumbing, to Walker Co., Hamilton, $17,860***electrical wiring, to Beltzhoover Electric Co., northeast corner of 4th and Plum Sts., Cincinnati, $14,360 ***heating, to Peck, Hannaford & Peck, Court and Sycamore Sts., Cincinnati, $34,268. Grand total $425,217. **P.W.A.** Bids July 9. Noted June 28.

†Tex., Three Rivers—Three Rivers Gardens, Inc., Chamber of Commerce Bldg., general contract subsistence houses, to Cage Constr. Co., Taft, $74,386.

Utah, Springville—Mount Nebo School Dist., Spanish Fork, addition to Jefferson School, to G. A. Barnett, Payson, $9,385***Grant and Lincoln School additions, to Olsen & N[illegible], Springville, $21,100. **P.W.A.** Part of $[illegible]000 P.W.A. school program. C. Ashworth, Provo, archt.

†Va., Quantico—Yards & Docks, Navy Dpt., Wash., D. C., altering quarters, Spec. 771[illegible], to Temple Constr. Corp., 11 West 42nd St., New York, $26,300. Bids June 27. Noted June 21.

†Wash., Fort Lewis—Con. Q.M., flooring for drill hall, to H. S. Wright & Co., 2210 Indiana Ave., Seattle, $12,320.

Ont., Ottawa—Ottawa Hydro-Electric Comn., Bank and Albert Sts., 4 story, basement office building with showrooms on ground floor, Bank St., to A. I. Garvock, Sparks St., $113,000. Awarded July 21. Noted Apr. 26.

COMMERCIAL BUILDINGS

PROPOSED WORK

Calif., Los Angeles—California Fruit Growers Exchange, 6th and Hill Sts., plans by A. R. Walker & P. A. Eisen, Pacific Commerce Bldg., office building, 5th and Hope Sts. Est. about $1,000,000. City Council granted zone variance for site, authorization specifying that improvements must be under way within 180 days from time mayor signs variance.

Colo., Pueblo—Y.M.C.A., 8th St. and Santa Fe Ave., Miss Dora Eddy, secy., plans by W. De Mordaunt, 1st Natl. Bank Bldg., and takes bids in fall for 3 story, fireproof dormitory and swimming pool. Noted July 27, 1933.

Conn., Middlebury—Westover School, J. P. Elton, 70 Church St., chn. Bd. Directors, plans for stone memorial library, held up indefinitely, $105,000. E. B. Goodell, Jr., 234 Boylston St., Boston, Mass., archt. Noted June 28.

Conn., Plainfield—Genaron & Deitch, J. Genaron, 1213 Main St., West Warwick, postponed construction until fall, 1 story, basement, brick theater, Allen Ave. $105,000. Private plans. Noted May 24.

Mo., St. Louis—Domus Italica, c/o H. Marshelli, acting secy., 220 North 4th St., plans brick, concrete, stone community building. $105,000. Drive for funds underway.

N. Y., Fishkill—Syndicate, c/o Marc Ba[illegible], 1350 Bway., New York, plans residential development on 400 acre site on Albany Post Rd., near here. To exceed $100,000.

N. Y., Jamaica—Jamaica Fulton Operating Co., R.K.O. Bldg., 6th Ave. and 50th St., New York, plans by T. W. Lamb, 701 7th Ave., New York, theater, Jamaica Ave. and 168th St. $250,000.

N. Y., New York—Fordham University, 3rd Ave. and 190th St., plans by R. J. Reilley, 12 East 41st St., New York, class room building. $500,000. Noted July 5.

N. Y., New York—Fort Independence Realty Corp., 271 Madison Ave., plans by Ely Jacques Kahn, 2 Park Ave., 141x247 ft. apartment, 230th St. and Spuyten Duyvil Parkway. $250,000.

O., Tiffin—St. Joseph Roman Catholic Church, plans by A. F. Herman, 711 Owen Bldg., Detroit, Mich., 2 story, basement, 60x130 ft. brick, rein.-con., stone, steel church, plain found. $105,000. Noted Apr. 26.

O., Youngstown — Mahoning Garden Homestead, Inc., P. Schaff, pres. and mgr., plans constructing fifty of 139 dwellings approved by Federal authorities. Each unit to cost about $3,600. Est. $500,000.

Tex., Longview—Southwestern Bell Telephone Co., 308 South Akard St., Dallas, and New York, sketches 4-5 story, basement, fireproof office and business building. $265,000. Private plans.

Wash., Spokane—Washington Water Power Co. plans by Whitehouse & Price, Spokane, 2 story, rein.-con. office and remodeling 4 story building, Lincoln and Trenton Aves. $175,000.

Que., Montreal—Alliance Nationale Societe d'Assurance Mutuelle, Sherbrooke and University Sts., bids in August, 3 story, brick, stone, steel office, with foundations suitable for 8 story structure. $250,000.

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†*Federal Government*

Commercial Buildings (Continued)

BIDS ASKED

O., Toledo—Aug. 15, by Y.M.C.A., P. B. Williams, secy., 6 story Y.M.C.A. building, Jefferson and 11th Sts. Est. $600,000. Mills, Rhines, Nordhoff & Bellman, Ohio Bank Bldg., archts. H. Anderson, chn. Building Com. Noted Mar. 15.

Pa., Warren—Aug. 4, by A. G. Eldred, chn. Building Comn., Watson Memorial Home for Women, Warren Natl. Bank Bldg., 2 story, brick, steel, concrete, U-shaped home for aged. $110,000. R. A. Freeburg, 1301 West 3rd St., Jamestown, N. Y., archt. Noted Aug. 25, 1932.

CONTRACTS AWARDED

Conn., Hartford—G. Fox & Co., M. Fox, pres., furnishing, installing 2 escalators in department store, Main St., to Otis Elevator Co., 244 Pearl St., approximately $34,000. Noted Jan. 4.

Ill., Chicago—Warner Bros. Circuit Management Corp., 1307 South Wabash Ave., general contract, 1 story, basement, 100x190 ft., brick, rein.-con. theatre, store, plain found., 95th and Ashland Ave., to J. W. Snyder Co., 307 North Michigan Ave. R. F. Perry, 32 West Randolph St., archt. Helmuth Bartisch, 32 West Randolph St., assoc. archt. General contractor takes bids about Aug. 1 on sub contracts except masonry and carpentry.

N. Y., Brooklyn—Lincoln Savings Bank, 531 Bway., 2 story bank, 5th Ave. and Bay Ridge Parkway, to A. A. Lutz, 300 Madison Ave., New York. Est. $200,000. Contractor soon takes bids on separate contracts. Noted July 5.

N. Y., New York—Liggett Building, Inc., Chase National Bank, trustee, 18 Pine St., elevator equipment and signalling devices, for Liggett Building, Madison Ave. and 42nd St., to Otis Elevator Co., 11th Ave. and 26th St. Est. about $28,000.

N. Y., Syracuse—M. Hemmer, general contractor, 1620 Burnet Ave., structural steel incl. erection for parish house, to Syracuse Eng. Co., Everson Bldg., for Church of Assumption. Noted July 19, under "Contracts Awarded."

R. I., Providence—J. J. Newberry Co., 245 5th Ave., New York, altering and constructing 4 story, basement, 145x170 ft., store and warehouse addition, Westminster, Eddy and Fulton Sts., to Casper Ranger Constr. Co., 20 Bond St., Holyoke, Mass. Private plans.

Ont., Toronto—George A. Fuller Constr. Co. of Canada Ltd., general contractors, Metropolitan Bldg., inspection for hospital, Grosvenor St. and Surrey Pl., for Women's College Hospital, 125 Rusholme Rd., to Canadian Inspection & Testing Co. Ltd., 52 York St.***glazing, to Consolidated Plate Glass Co. of Canada Ltd., 241 Spadina Ave.***plumbing and heating, to H. Griffiths & Co., 1128 College St.***electrical work, to Canadian Comstock Co. Ltd., 80 King St. W. Noted June 14 under "Contracts Awarded."

Que., Montebello—Reverend Mother Superior, Dominican Sisters, Three Rivers, 4 story, basement, 85x125 ft., brick, stone, steel convent, plain found., to Heroux & Robert Ltd., 1414 Crescent St., Montreal. Est. $200,000. Awarded July 16.

INDUSTRIAL BUILDINGS

PROPOSED WORK

California—ORE MILL—Big Wedge Gold Mining Co., 407 Trans-America Bldg., Los Angeles, plans ore mill and mining development in Inyo Co. To exceed $100,000.

Calif., Fallbrook—PACKING PLANT—Fallbrook Citrus Assn., plans packing plant, Beech St., near railroad tracks. $30,000.

Calif., Maywood — FACTORY — McCloskey Varnish Co., Rhawn St. and State Rd., Philadelphia, Pa., purchased 2 acre site near here, and plans plant and warehouse for manufacture of technical varnishes, driers and grinding fluids used by paint manufacturers; 5474 East Slauson St., $150,000.

Calif., Ventura—PACKING PLANT—Saticoy Lemon Assn., A. J. Thille, pres., soon lets contract packing plant. $45,000. R. C. Wilson, 112 South Mill St., Santa Paula, archt.

Ga., Quitman—PLANT—Potato Starch Products, Inc., Quitman, plans potato starch plant. $280,000.

Ill., Cairo—MILL and YARDS—E. L. Bruce Lumber Co. plans mill and yards. To exceed $50,000. Architect not appointed.

Ill., Chicago—FOUNDRY—International Harvester Co., 606 Michigan Ave., plans altering and constructing 2 story, foundry addition, 260 South Hoyne Ave. $30,000.

La., Jennings—BOOSTER STATION—Shell Oil Co. plans booster station on J. Kratzer Farm, near here. $40,000. Private plans.

Md., Baltimore—DISTILLERY—Winand-Pikesville Distillery Co., 1920 Belair Rd., plans altering and constructing addition to distillery, near here. To exceed $100,000.

Md., Highlandtown (Ind. sta., Baltimore)—SHED—L. R. White, Jr., archt., 10 West Chase St., soon lets contract 1 story, 132x160 ft. shed for Crown Cork & Seal Co., Eastern Ave. and Kresson St. Est. $50,000. Structural steel, to Baltimore Steel Co., 1400 Eastern Ave.

Mass., New Bedford—CASTING SHOP—Revere Copper & Brass, Inc., 24 North Front St., plans 1 story, 167x190 ft., brick, structural steel, concrete, North Front St. To exceed $40,000. Private plans.

Mass., New Bedford—FOUNDRY—Revere Copper & Brass, Inc., R. G. Scott, North Front St., bids in August, brick, steel brass foundry unit. Private plans.

Minn., Nevis—CREAMERY—Nevis Creamery, Nevis, plans creamery. Est. about $28,000 with equipment. Architect not appointed.

N. J., Paulsboro—FACTORY—Sandura, Inc., Finance Bldg., Phila., Pa., soon takes bids rebuilding plant. $125,000. Ballenger Co., 12th and Chestnut Sts., Phila., Pa., archts. Noted Feb. 22.

N. Y., Jamaica—STORAGE, BUS SERVICE, etc.—Jamaica Busses, Inc., 107-16 New York Ave., plans by M. Smith, 475 5th Ave., New York, 1 story, 130x212 ft., brick, New York and 114th Aves. $50,000.

N. Y., Long Island City—FACTORY STORAGE—National Sugar Refining Co., 129 Front St., New York, plans 1 story, 102x122 ft., brick, 2nd St. and 56th Ave. $45,000. N. A. Andrews, Yonkers, or c/o owner, archt.

N. Y., Lyndonville—PLANT—Speas Mfg. Co., St. Louis, Mo., plans vinegar, pectin and carbolic acid plant on 200x500 acre site at Millers, 4 mi. west of here. $75,000. Owner may be reached through G. Ressequie, Lyndonville.

N. Y., Maspeth—FACTORY—Herbro Realty Co., 5746 Flushing Ave., Flushing, plans by S. Goldsmith, 589 Flatbush Ave., Brooklyn, 1 story, 100x140 ft., brick, 59th St. and 59th Dr. $28,000.

N. Y., Oswego—YARDS and STORAGE—T. J. Burke Lumber Co. plans repairing yards and storage, damaged by fire. $28,000 with equipment. Architect not appointed.

N. Y., Ridgewood—FACTORY—Malt Diastose Co., Wyckoff and Decatur Sts., plans by M. Hiller, c/o owner, 2 story, 39x53 ft., brick, Wyckoff and Decatur Sts. $28,000 or more with equipment.

N. Y., Waterloo—DISTILLERY, etc.—New York & Kentucky Co., 7 East Seneca St., Buffalo, plans steel distillery and office building, plain found. $150,000. Owners building office building in connection with this project at once. H. M. Naylor, c/o owners, Buffalo, in charge.

N. C., Burlington—DAIRY—Melville Dairy Farm plans milk pasteurizing plant. $40,000, incl. equipment.

N. D., Mandan—STORAGE—Occident Elevator Co. plans storage. $28,000 with equipment. **Maturity indefinite.** Architect not selected.

O., Cincinnati—FACTORY—Andrew Jergens Co., 2535 Spring Grove St., plans by Tietig & Lee, 34 West 6th St., 8 story, basement, 300,000 cu.ft. floor space factory, Spring Grove St. $400,000. A. M. Kinney, Inc., Carew Tower, engr.

O., Mansfield—FACTORY—W. R. Miller & Associates, 151 West 3rd St., plans factory for manufacture of glass-lined steel barrels. To exceed $28,500. **Maturity indefinite.** Architect not appointed.

Ore., Eugene—STORAGE YARD, etc.—Walters Bushong Lumber Co. plans storage yard and mill. $28,000 or more. Architect not appointed.

Pa., Jeannette — BOTTLING HOUSE — R. J. Brocker, archt., Coulter Bldg., Greensburg, soon lets contract superstructure for 100x103 ft., brick, tile, steel bottling house, for Jeannette Brewing Co. $28,000.

Va., Roanoke — FURNITURE STORAGE — Phelps & Armistead, Roanoke, plans furniture storage, Norfolk Ave. $30,000 or more. Architect not appointed.

Wash., Seattle—PLANT—Ehrlich Harrison Hardwood Co., 35 Hanford St., plans plant. $28,000 or more with equipment. Architect not appointed.

W. Va., Keystone—DISTRIBUTION, STORAGE, etc.—Koppers Co., plans distribution, storage and store. $30,000 or more. Architect not appointed.

W. Va., Wheeling—PLANT—Hazel Atlas Glass Co., plans by F. Faris, 1117 Chapline St., plant addition. $125,000.

Wis., Eau Claire—HEATING PLANT—Wisconsin Steam Corp., Eau Claire, plans by A. W. Buell, 363 Snelling St., St. Paul, Minn., central heating plant and distribution lines. $200,000.

B. C., Vancouver—PLANT—Capilano Shingle Co. Ltd., 1500 Royal Bank Bldg., plans planing plant. $50,000.

B. C., Vancouver—MILL—Western Red Cedar Mills Ltd., plans rebuilding mill, destroyed by fire. $250,000 loss. Interested in prices of equipment.

Ont., Greenville—MILL—Stutts Ltd. plans reconstructing paper mill. $40,000.

Ont., Toronto—PLANT—Liquid Carbonic Canadian Corp. plans factory for manufacture of carbon dioxide and dry ice. $50,000.

Que., Chandler—PLANT—Premier Pulp & Paper Corp. plans plant. $100,000.

Sask., Regina—DEHYDRATING PLANT—East Crest Holding & Development Co. Ltd., Calgary, Alta., plans second de-hydrating plant for recovery of sodium sulphate deposit from Whiteshore Lake. **Maturity in fall.**

BIDS ASKED

Mich., Pleasant Ridge—BREWERY—G. A. Mueller, 1001 American Radiator Bldg., Detroit, archt., taking bids 4 story, 30x60 ft., rein.-con., brick, steel brew house, plain found., also rebuilding present bakery building into brewery plant, Woodward Ave. and Ten Mile Rd., for Voigt Brewing Co., c/o Architect.

Tex., Victoria—CHEESE PLANT—Kraft Phenix Cheese Corp., Chicago, Ill., taking bids 1 story, 70x90 ft., brick, rein.-con. manufacturing plant, plain found., incl. latest machinery and equipment. Site purchased. Private plans.

Ont., Amherstburg—PLANT—See "Contracts Awarded."

CONTRACTS AWARDED

Mass., Westfield—MILK PLANT—J. Herlihey, Jefferson St., 1½ story, 85x100 ft., brick, steel milk plant, separate contracts. Est. $30,000. R. M. Sizer, 24 Chestnut St., archt. Noted June 21.

Mass., Salem—FACTORY—Bay State Belting Corp., 349 Congress St., Boston, 1 story, basement, brick, concrete, steel addition. Owner builds under supervision J. A. Roberts, 5 Gorham Rd., Medfield, engr. Est. $25,000 or more.

Mich., Detroit—MACHINE SHOP—Chevrolet Motor Co., 1840 Holbrook Ave., 1 story, brick, steel, rein.-con. machine shop addition, plain found., Holbrook Ave., to O. W. Burke Co., 439 Penobscot Bldg. Est. $30,000. Albert Kahn, Inc., New Center Bldg., archt.

N. J., Jersey City—STORAGE TANKS—Colgate, Palmolive Peet Co., 105 Hudson St., storage tanks, 175 tons steel, to Chicago Bridge & Iron Wks., 37 West Van Buren St., Chicago, Ill., and New York City. Est. exceeds $28,000.

N. Y., Rome—FACTORY—Zingerline Bros., general contractors, Front St., structural steel for factory, to Utica Steam Engine & Boiler Wks., 800 Whitestone St., Utica, for Revere Brass & Copper Co., Rome. Est. $105,000. Noted July 26, under "Contracts Awarded."

O., Cleveland—ELECTRIC SUBSTATION—Cleveland Railway Co., A. C. Kennedy, purch. agent, Midland Bldg., 1 story, 30x30x14x21 ft., brick, steel, concrete electric substation, 4190 Rocky River Rd., to Lundoff-Bicknell Co., Keith Bldg. Est. $60,000. Awarded July 25. Noted June 29, 1933.

O., Dayton—FACTORY—Inland Mfg. Co., 15 Coleman St., 2 story, basement, 150x414 ft., brick, rein.-con. factory, plain found., to H. R. Blagg Co., 1229 East 3rd St., $300,000. Noted June 14.

Pa., Connellsville—WAREHOUSE—A. Overholt & Co., Pittsburgh, Pa., and 120 Bway., New York, brick, steel warehouse, Broad Ford St., near here, to Sanderson & Porter, 52 William St., New York. Est. $150,000. Work started.

N. S., Hantsport—PLANT—Minas Basin Pulp & Power Co., awarded contract to supervise engineering and construction of new power plant having 4,200 hp. on 176 ft. head capacity on St. Croix River, 30 mi. from Halifax, 7½ mi. from Windsor and 12 mi. from owner's pulp mill at Hantsport, to Power Corp. of Canada Ltd., 355 St. James St. W., Montreal, Que.

Ont., Amherstburg—PLANT—Brunner Mond Co., 1 story, 100x200 ft., steel, concrete calcium chloride manufacturing plant, day labor. Owner's own engineers will supervise work.

Ont., Port Hope — FACTORY — Sproatt & Rolph, archts., 1162 Bay St., Toronto, 2 story, 45x145 ft., rein.-con. addition to plant, Cavan St., to Wells & Gray, Ltd., 701 Confederation Life Bldg., Toronto, for Nicholson File Co., Cavan St. Noted June 14.

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†Federal Government.

For official proposal advertising see Searchlight Section

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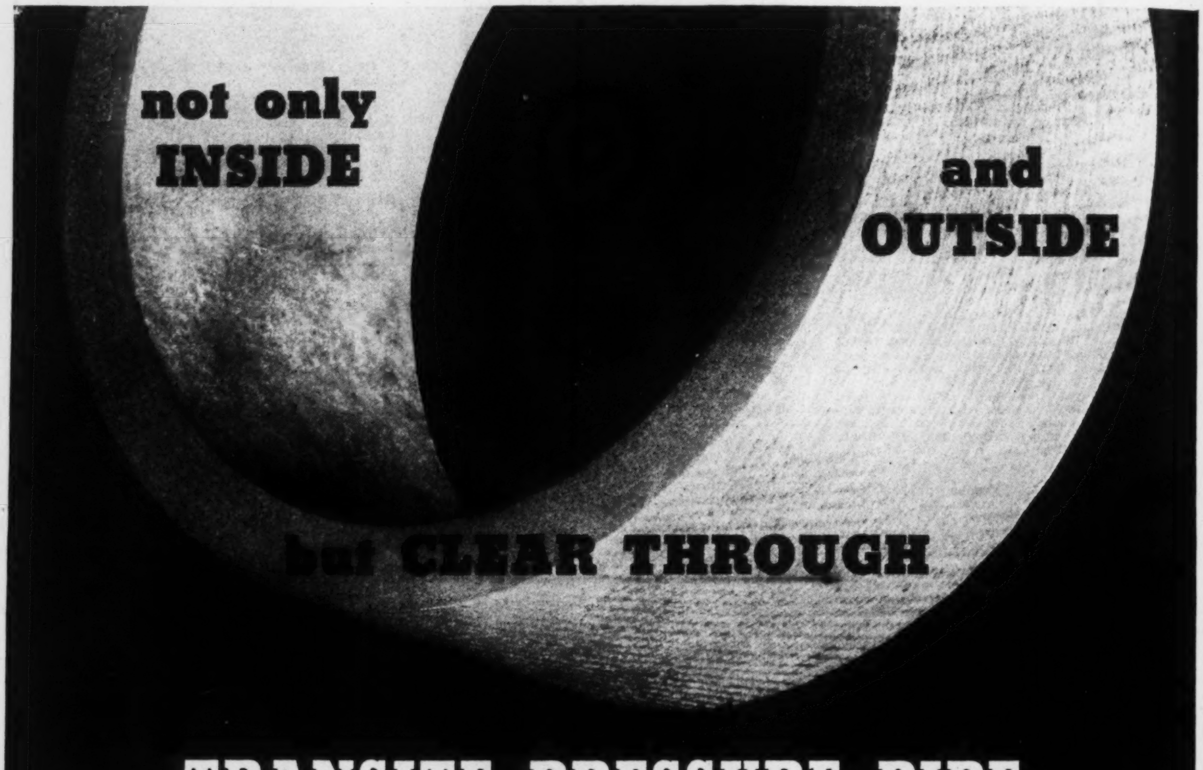

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